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[ILLUSTRATED.]

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Wrinkles in Electric Lighting—No. II.

BY LEWIS F. LYNE.

SELECTION OF GROUND FOR A STATION AND LINE CONSTRUCTION.

In the construction of a line of wires for electric lighting purposes the first step to be taken is to canvass the district to be lighted in order to see who will take lights and where they are to be located. After suitable guarantees have been secured from prospective consumers the next step is to select a site for the station.

If it is intended to operate both arc and incandescent machinery, as is the case in most instances at the present day, the station should be located as near the center of the district as possible, even though the cost of lots may be much greater than in the suburbs of the town or city. The difference in cost of real estate is to be weighed against the cost of copper for the construction of lines or conductors. A careful estimate of the cost of conductors must be made, reaching from the different parts of the district to be lighted to the sites selected for the station, then by a comparison of the difference between cost of conductors and real estate it becomes a very easy matter to determine which is the most economical.

Another very essential consideration in the selection of ground for an electric light station, is in securing sufficient ground to allow an increase of facilities for furnishing light. A mistake in this direction is too often made, to the dissatisfaction of the superintendent and at the expense of the stockholders. It is a very costly process to be compelled to move just as the business begins to exhibit signs of a healthy state, and to move machinery makes sad havoc with the dividends

Where arc lights only are intended to be furnished it is not so necessary to locate near the center of the district to be lighted as in the case of incandescent lighting, because for arc lights the conductors, which, in the majority of instances, are of No. 6 copper wire, are not so expensive as the larger ones used for incandescent lighting; therefore, in such cases, the advantage of the low price of real estate may be taken. I would say further, in this connection, by all means avoid, if possible, building upon ground that requires the driving of piles for a foundation. Many times this admonition is disregarded and the careless ones soon pay for their indiscretion in bills for repairs to machinery. Of course I understand that there are localities where whole cities are built upon piles, and my remarks are not intended to apply in such cases, but there are towns that are built partly upon natural and partly upon made ground. In such instances build upon the natural ground if possible. Having determined upon the site for the station, then secure the right of way or a franchise for erecting poles and running the wires. After this has been done the wishes of the property owners, in front of whose premises the poles are to be erected, should be consulted. The city or town lamp-posts should be at first located by the proper municipal officials, but according to the best authorities this does not give the electric light company the right to disfigure an individual's premises or in any way obstruct the front of his buildings. After that the line poles should be located. These poles should be not more than 125 feet apart unless the circumstances are such that poles cannot be placed so nearly together. In such instances higher poles must be used, and the wires placed farther apart than in the regular way. A gentleman having a fine building does not wish to have an unsightly, crooked pole placed in front of his premises, and may be expected to make an obstinate fight when the attempt is made to tear up his new flag stones for the purpose of erecting a pole which will ruin the appearance of his property. Such individuals ought to be consulted, and if this course is taken, althouga the person may be very unreasonable at first, he will generally come to reason at last unless he is heavily encumbered with gas stock. If such is the case there is only one of two things to be done, viz., fight him or cross the street.

I had an experience with a gentleman who had just had a concrete pavement laid in front of his new building, and when interviewed in reference to having a lamp-post placed upon his corner, he said "no" very emphatically. I tried to reason with him in regard to the style of post and the manne of placing it, but all to no purpose. The principal argument he advanced was, that he would not have his new sidewalk torn up by setting poles and replacing the same when rotten. This was of course a knock-down argument, but I quickly sketched upon a piece of paper, a plan which at once convinced him that it was all right, and in three days I had the lamp-post in place. Since then I have had occasion in many instances to use the same plan in surmounting various obstacles. I will describe it.

I had a pattern made of the form shown in Fig. 1. It consists of a cast-iron tube, 8 inches diameter inside, 24 inches long, with a flange 24 inches square and 1 inch thick to form the base. The collar about the top was 1 inch thick, and the rest of the tube ½ inches in thickness. This casting had a hole 4 inches in diameter through the base, to support the end of the core in casting. This casting was imbedded in the sidewalk and the collar at the top allowed to project ½ inch above to keep the water from running from the sidewalk into the hole. I had the mason take special pains in doing his work well, so that when the casting was imbedded in the concrete, one would not know that the walk had been disturbed. I then had a nice, straight, pine lamp-post made to fit the hole in casting, which, when erected, was more ornamental to the property than otherwise. The owner was pleased with it and went so far as to compliment me upon the execution of the work. Had I undertaken to fight him I would never have put a pole in front of his premises.

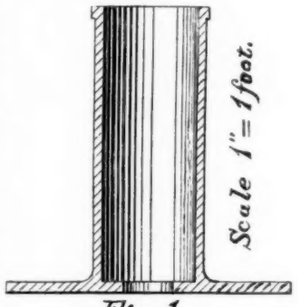

Fig 1.

I have had to use the casting shown in Fig. 1 in cases where there was but 18 inches to 24 inches of soil upon solid rock, and where it would have cost a large amount to blast out a hole to set a pole. I simply cleared off the surface of the rock and set these castings in a bed of Portland cement concrete and the casting became a part of the rock itself. Most men would either have blasted the rock or by main force have picked a hole into it with bars.

This form of base for holding poles is far preferable to that of placing the casting above ground and bolting it to the top of flags, where it appears so unsightly.

I had occasion to run a line of poles through a street where there were coal vaults in front of almost every building and where there was not dirt enough in which to dig a post hole, so I resorted to the casting shown in Fig. 1, and had it set into the masonry of the vaults. Now when a pole rots at the bottom, all I have to do is to pull the old one out and put another one in without disturbing the sidewalk In setting line poles, it is best to place them on the line between two lots, when possible, as both property owners are then much better satisfied than when they are placed in front of a door or window.

PORTABLE ELECTRIC LIGHT GALVANOMETER.

NEW IRON FRAME BELL OF ELECTRICAL SUPPLY CO.

Putting the Wires Out of Sight.

The Subway Commissioners' meeting last week was attended by all three members of the Board. Dr. Ledoux, the chemical expert, reported that zinc tubes could be used in the conduit. Supt Beckwith, of the Metropolitan Telephone Co., informed the Commissioners that his company was taking measures to remove its wires and poles from the surface in Sixth avenue and lay them in the subway, so far as completed, between Twenty-third street and Central Park. He also asked permission to substitute new poles for a number of old and half-rotten ones in Essex and Hester streets, unless the commission was likely to furnish underground accommodation in that neighborhood very soon. The request was referred to Engineer Kearney. Mr. Lauterbach reported in behalf of the construction company that work would begin this week on a subway through One Hundred and Twenty-eighth street, from Third to Fourth avenue, which, connecting with the cables of the Western Union Company, strung on the elevated railroad structure, would enable that company to put all its wires out of sight. The Park Commissioners refused permission to lay conduit through City Hall Park, and a different route was selected.

The Electrical Supply Company.

There is an activity in the electrical business that is very gratifying to those houses that aim to keep in the front ranks in the matter of supplying the electrical trade with whatever it demands. One of the earliest, and today one of the best-known houses in the trade, is the Electrical Supply Company, with factories at Ansonia, Conn., and large storehouses and agencies in New York and Chicago. Recently a handsome and exhaustively illustrated catalogue, full of much that is valuable and important in the matter of electrical information and electrical construction, has been issued, and will be sent to all inquirers. In no one branch of their business is the New York house (17 Dey street, Mr. H. P. Hungerford, agent) busier at the present time than that of furnishing annunciators, illustrations of which appeared in a recent number of the ELECTRICAL REVIEW. Vibrating bells, also, are now called for, the one illustrated on this page being in much demand, as it does most excellent work with little battery power. The portable electric light current galvanometer, in polished mahogany cases complete, every instrument being tested and calibrated by Prof. Ayrton or Prof. Perry, is an instrument that measures directly in amperes the strongest electric light currents without calculation or reference to any table; it is very "dead beat," that is, sudden changes in the strength of the current are accurately indicated, and the readings are unaffected by changing the position of the instrument. In addition, the accuracy of the readings can at any moment be checked by the employment of only a single cell, in the following way: The thick wire coiled round the needle, and through which the electric light current circulates, is in reality a strand or little cable, composed of ten insulated wires, and which are usually joined in multiple arc by means of the little commutator seen in the figure. But by

one-quarter turn of this commutator the wires are joined in series, and now any deflection is produced by exactly one-tenth of the current previously producing the same deflection. To check, then, the value, in amperes, of a strong current producing any deflection, it is only necessary to ascertain the strength, in amperes, of the weak current producing the same deflection when the wires are in series; or, indeed, any other deflection will do equally well, since the coils are so placed that the strength of a current is directly proportioned to the deflection it produces. Complete instructions for using the galvanometer, which is illustrated in this edition, are given in the catalogue.

On Distributing Electricity by Transformers.*

*Paper taken as read before the British Association at Birmingham.

BY CHARLES ZIPERNOWSKY.

After a brief reference to the several attempts that have been made to overcome the difficulties in the way of lighting a considerable area by means of electricity since the subdivision of the electric light has become an accomplished fact, the author points out that a practical system of distributing electric energy over a large area can only be based upon the use of high tension currents for conveying the energy from the generating centers, in combination with some mode of reducing the high tension to the limits of difference of potential which can be made use of without danger or difficulty. This limit is at present about 100 volts. Many methods have been suggested for meeting these conditions.

Thus a counter electromotive force can be introduced into the high tension circuit, as in the case of accumulators, and the terminals of such a device connected with the lamps, etc. This cost is, however, a great defect of the system, and the high tension current which exists at each lamp might lead to fatal consequences.

After referring to the electric transmission of power as another means of overcoming the difficulty, the author discusses the use of induction coils or "transformers" in some detail, tracing their use in the first instance to C. W. Harrison in 1857. Among subsequent workers Ja lochkoff, C. T. Bright, Fuller, Varley, Haitzma Enuma, Gaulard and Gibbs are mentioned; and he points out that the want of success was in great part due to the fact that the transformers were connected up in series—an arrangement which is only suitable for use with an invariable number of lamps in any one secondary circuit, or when each transformer supplies only one lamp.

Besides considerations in regard to cost, the conditions to be satisfied by a system of electric distribution are stated as follows:

1. Perfect independence of the several consumption devices.

2. Absolute and relative economy, so that the consumption of energy is in proportion to the number of lamps in use.

3. All regulation to be concentrated at one central station.

The author then proceeds to describe the method he has devised in conjunction with M. Max Déri, and, with the assistance of M. O. T. Blathy, to satisfy the above conditions.

This is based on the fact that, with a constant primary tension, the secondary one will vary only in proportion to the internal resistances of the coils; and as the resistance of each coil is less than one per cent. of the external resistance, the secondary tension will not vary more than two per cent., whatever be the intensity of current supplied to the consuming device. Constancy in the primary tension at the transformer terminals is secured by connecting them in multiple arc with the main line, and the arrangements are such that current and tension are distributed in the primary circuits, much as in a low tension direct supply system, the transformers simply acting as tension reducing devices.

Instead of the old Ruhmkorff coil pattern of transformer a form is adopted such that the lines of magnetic force circulate entirely in iron, or as nearly so as possible, by which arrangement a considerable economy of magnetizing force is effected and other advantages are at the same time gained. Two forms of transformer made on these principles are described, as well as the self-regulation of alternating current machines, which is especially valuable in installations of moderate size

This system is at present in use in the towns of Gerona in Spain, Lucerne, in Milan, and stations are in course of erection in Turin and Rome. The arrangements for the last named are explained in detail and illustrated by a diagram, and the author concludes by pointing out that, although the last word has not yet been spoken in relation to the distribution of electricity over large areas, the above system is the only one with which he is acquainted that approximates to the fulfillment of an ideal distribution.

Lighting a Theater.

Probably the most important investigation this year has been made by Dr. Breslauer, in Berlin. The question was to determine the difference, if any existed, between the effect of illumination by gas and that of electrical light on the air in a large crowded building. For this purpose the Royal Theater, in Munich, was selected, and the experiments were made with that thoroughness with which they are usually undertaken by German scientists.

The air was examined in the parquet, the gallery and the center of the latter, and observations were made while the house was full and when empty. The results were as follows: With electric light and with gas the increase of temperature noted from beginning to end of play was:

	Electric light.	Gas.
In parquet	2.5	25.1
In gallery	8.1	26.1
Center of gallery	9.3	26.7

The percentage of carbonic acid per thousand volumes of air was:

	Electric light.	Gas.
In parquet	0.055	3.926
In gallery	0.870	3.151
Center of gallery	1.178	4.353

Under the effect of gas the percentage of carbonic acid increased, therefore, above the limits of safety from 1.81 to 3.35 per mille. Many other observations concerning the percentage of watery vapor, etc., were also made; but we simply mention their result, together with the investigator's *resume* of the whole.

1. The air with electrical illumination does not reach in a theater the former high temperature, a fact especially of advantage to those frequenting the gallery.

2. The air remains purer; it contains far less carbonic acid, and almost no smoke particles.

3. There is no longer so much moisture added to the air as used to be the case with illumination by gas, and the less the percentage of moisture in a crowded room the more agreeable will be the air to persons living in it, and the less favorable will be the conditions for the development and the propagation of pathogenic germs, especially if the moisture diminishes in the same ratio as the temperature sinks, always occurring under the effect of the electrical light.

4. The quality of the air has become a far more uniform one in all parts of the house, while with illumination by gas the air becomes the hotter, the more moist and the more impure the higher situated the seats are.

For hygienic purposes in the same theater another alteration has been made, viz., the substitution of more opaque glass for the globes of the electric light. Though the illuminating power has diminished under its use from 20 to 25 per cent., the effect on the eyes is less injurious, as it produces a peculiar yellow light very agreeable to the eyes. —*Medical and Surgical Reporter.*

*** Brockton, Mass., will put in a small Western Electric multiple board. The demand for trunk line service necessitates this improvement.

Ladies Shaved by Electricity.

A SIMPLE OPERATION TO REMOVE MOUSTACHES FROM FAIR FACES.

A permanent removal of hair from the face of a lovely or unlovely woman has heretofore been considered an impossible achievement. To make the hair grow on the bald pate of an elderly gentleman has always been a doubtful experiment, some asserting that it can, others that it cannot be done, but the eradication of hair was considered impossible. Now the removal of hair, even a big moustache, an imperial, and whiskers, can be taken off without leaving a trace or scar. Moreover, when properly performed by an expert electrical surgeon or surgical electrician, whichever you choose to call the operating doctor, not a hair ever grows there again.

Yesterday I saw the operation performed by Dr. W. H. King, says the correspondent of the *N. Y. Sun*, and was enlightened at the same time as to how the electrical current was applied and made to do its work. In the first place, a pretty young girl of about 19, who was the subject of the operation, took her seat before a large window in the doctor's operating chair. She was a little nervous at first while the doctor was changing and arranging his galvanic battery. A fine needle, made especially for the purpose, was carefully inserted into the skin of the young lady's upper lip, just where the first hair to be eradicated grew.

"The needle is now in the hair follicle itself," said the doctor. "You see she has not flinched. It has given her no pain to indent the needle, for it is too sharp and fine to be felt. Now I will connect the needle with this negative pole of the battery, just so, while this positive pole is connected with this flat piece of metal, an electrode, placed on her cheek. It can be placed on any part of the body, the object being simply to complete the electric current."

"Ah, it stings," cried the young girl, but she did not move.

"It is more or less painful," continued the doctor, after a little soothing attention to his patient, "according to the location of the hair on the face and the nervous sensibility of the patient. Look here; now there is a little frothing around the needle. I will withdraw it and"——

He withdrew the needle and lifted out the hair without giving the young lady any pain. Quickly inserting the needle in another follicle he repeated the operation, and this time the patient only gave a slight shiver. She smiled and said:

"It is less painful or I have become accustomed to it. Go on, doctor."

The operation was continued, the operator taking out from about five to ten hairs every minute. This was continued for thirty minutes, the length of time allowed by Dr. King for each sitting, both patient and physician needing rest after that length of time. While the operation was going on I interviewed the doctor thus:

"How long has it been since this operation was performed?"

"Dr. George H. Fox, some eight years ago—I think it was in 1878—read before the New York State Medical Society a paper on the subject of the permanent removal of hair by electrolysis. Since then most of the electricians in this city have been making use of Dr. Fox's process. With only slight variations, the operation is practically the same as that first described by Dr. Fox."

"Is it a difficult or dangerous operation?"

"Neither difficult nor dangerous in the hands of a good electrician. It requires fine eyesight, a good light, a steady hand and nerve, and great patience on the part of the operator as well as the patient. If operated by a skillful surgeon, it can be performed in about as many sittings as will be required to take out from one hundred to two hundred and fifty hairs a day. One sitting a day, half an hour long, is all that a judicious operator will allow."

"Will not some of the hairs grow again."

"Yes, a few. If the operator has skill and experience, there will probably be a growth of from five per cent. to ten per cent. of the hair removed. If a tyro performs the operation, perhaps thirty or fifty per cent. will return. Then it will be only necessary to repeat the operation."

"Is the operation frequently performed?"

"Yes; as it becomes known it is more frequently called for, and the practice is on the increase."

"Does it leave a scar?"

"Not unless the hair is coarse and deep set. Then there will be marks that will not disappear under a week perhaps, and perhaps in a few days. If the hairs are fine the electrolysis will not cause more than a slight redness, which will disappear in a few hours."

The young lady who had been operated upon seemed willing to have all of the hair removed in one sitting. About one-half had been taken off, or "lifted out," as the Doctor expressed it, before she rose from the chair, but Dr. King said that he never permitted a patient to sit for the operation longer than half an hour. So she reluctantly put on a thick veil to hide the half moustache which remained on her pretty face. Of course she promised to return next day for the completion of the electrolysis, and of course she kept her promise. B.

Arc Light Carbons.

We take pleasure in heralding what seems a marked bit of progress in arc-lighting. Inventors have run their lightning gamut from the dynamo to the lamp, embellishing here and there with the staccatos of regulators, cut-outs, clutches, circuits, until the bare history of it all makes a large library. A march of progress it has been truly, but the wayside is strewn with the skeletons of defunct "improvements," and every dynamo and lamp factory has its graveyard. Many an inventor has torn his hair and racked his brain to think where was the missing link in his lamp. Try how he would, it would get cranky. Now the clutch did it, anon the shunt, another time the ratchet, and sometimes in despair the "pesky dynamo" would get the blame. Mental torture overcome by patient perseverance would finally end, and the lamp with its praises sounded aloud would go forth, but the cruel knife of public criticism would hack it to pieces—a dismal failure.

Let any such inventor who has weathered the storm and shed the caul of inexperience, speak now, and he will say it was all the fault of the carbons, and he will be generally right; for his lamp had no serious defect, but his carbons had many.

Carbons are responsible for a vast amount of trouble to the electrical engineer and inventor. Volumes have been written about dynamos and arc-lamps, but the subject of carbons seems to have been reverenced by writers as a sacred cryptogram, whose mysteries it were anathema to reveal. Yet perhaps to-day the carbon pencil is the most important bond between electric lighting and financial success in its exploitation.

Natural gas is a queer thing. First we learn of it escaping for years in vast quantities from abandoned wells or "dry holes" in the oil regions of Pennsylvania. Then suddenly it begins to play an important part in the great manufacturing industries of the gas region, and now hundreds of big gas wells are pouring their long pent caloric into tens of thousands of seething furnaces in the Pittsburgh district; and with magnificent results practically and financially. It is a perfect fuel, and far the cheapest known. For the carbon maker it has an especial attraction, because so fine an agent in baking. Several are now applying the gas to heating their baking furnaces.

But the Solar Carbon and Manufacturing Company have gone many steps further. Owning a large tract of land in the gas territory, they drilled and now have two enormous gas wells, and have millions of cubic feet of gas daily at command. This gas is a pure hydrocarbon, and the daily output of one well means tons upon tons of chemically pure carbon. It is obtained in an absolutely pure state directly from the gas by the processes controlled by this company, and is in appearance more like large masses of black flint than anything else we know of. It is extremely hard and dense. Natural gas is used throughout. X. T.

Electricity in Nervous Cardiac Palpitation.

Meyer, Remak, Huchard, Eulenberg, Ziemssen, and others advocate galvanism applied in different ways for the relief of nervous palpitation, and Duchenne advocates faradization. The latter, however, has failed in most cases in the hands of others than Duchenne. The experiments of Ziemssen show the effect of the constant current on the heart to be like that on striped muscle, and the poles applied to the thorax are as efficacious as in any other manner.

As stated in our last review, we do not favor direct electrization of the heart as described in that paper; but the anode may be placed on the neck (auriculo-maxillary fossa), the cathode over the præcordia. Skorczewski, in a paper on this subject, noted diminution of the apex-beat of from ten to thirty pulsations in a few minutes under galvanism. *-Zeitschrift fur Therapie.*

Electrical Dosage.

At the recent meeting of the American Neurological Association much discussion was had, without coming to any conclusion, as to dosage, thickness of rehophore coverings, shape and size of rheophores, etc., all of which is hardly worth discussing. A reliable milliampere-metre, such as Fleming's or Barrett's, should always be included in the circuit when using galvanism, and the matter of thickness of coverings is simply one of resistance to be overcome by potential. A thin cover is just as good for most purposes as a thick one, and entails no waste, and, provided that the current is not "very strong" (seventy-five to one hundred and fifty milliamperes), the lighter the cover the better. Caustic effect being avoided, we need care little for the points discussed, and the ultra refinement of theoretical electricians simply befogs inexpert men, who see in such disquisitions imaginary difficulties in practical work.—*Ib.*

A Few Remarks by a Gas Journal.

We find the following in our highly esteemed contemporary, the *Progressive Age and Water Gas Journal*, of Philadelphia, which would indicate that there is not that fraternal feeling among the gas journals that all lovers of peace—and gas—should expect:

"In a late issue of our esteemed contemporary, the ELECTRICAL REVIEW, we find an editorial on 'Electricity *vs* Gas' In this article the writer urges that 'there should not be any conflict between gas and electricity as illuminating agents—our contemporaries in the field of gas journalism to the contrary notwithstanding.' The REVIEW recites the lessons taught by this journal, all of which are perfectly familiar to our readers, and earnestly advocates the harmonious working of gas and electric lighting companies. We are glad to see so able a paper as the ELECTRICAL REVIEW taking this sensible view on behalf of the electrical interests, and we welcome it to our standard. We were long ago convinced that our position in this matter was the true one, and hence it is that we have sought to bring about harmony between the two interests. If the REVIEW will continue in its good work, and do for the electric light what the *Progressive Age* has and will continue to do for the gas fraternity, a vast amount of time and money will be saved to both sides. We are indeed gratified to see our contemporary traveling in the direction long since pointed out in these columns, still we feel like chiding it, for our position ought to be too well known to the REVIEW for it to not make an exception of this journal in referring to 'gas journalism' as generally menacing the electric light.

"We are well aware that all gas journals have not reached that liberal and independent station that characterizes the policy of this paper—for one, that ancient and fossilized organ of an antiquated and barbarous method of gas manufacture, has sought in every manner to belittle the electrical people, and the REVIEW could quite properly stigmatize it as a clog on the wheel of progress, but we would shield the old *Laughing Gas Journal* from the shafts of so sprightly a journal as the REVIEW, and respectfully urge it not to be too severe on that ancient organ; a sudden shock to it might be productive of disastrous results, and therefore we caution our contemporary to not mind the tirades of the poor old *L. G. J.*, that is in its dotage and entirely harmless. We should have sympathy with its whimsical notions; it entirely lacks the vein to grasp a progressive idea. Hence we beg the REVIEW to tread lightly in the 'Hall of Mourning.'"

The Nature of Earth Currents.

M. Landeren, says *Engineering*, a French *savant*, has for years past been making observations on the nature and *role* of earth currents at the city of Tortosa, and some of his remarks thereon are worthy of note. He believes that he has discovered the existence of telluric currents produced by the wind; and he finds that the direction of the currents change during whole months at a time. From various experiments with aerial lines, a Mascart electrometer and galvanometers, he obtains the result that when the telluric current and the wind are both in the same direction, or if the angle their directions form is under a right angle, the deflections of the observing instrument are of the same sign; but when the wind is directly opposite in direction to the current, or at an angle over a right angle, the deflections are of a different sign. He concludes that the potential of the telluric current is very feeble, and that the wind electrifies the earth, rather than the wire, and develops in the earth a current of the same direction as itself, flowing through the soil over a large cross-section. While upon this subject we may mention a published report from America for the truth of which, of course, we cannot vouch) to the effect that Mr. Edison is occupying his mind with the problem of utilizing earth currents for telegraphic purposes. How he is to do it without the use of aerial wires is one of the mysteries of the report in question.

Possibilities in Railroad Speed.

WILL IT REACH THE RATE OF 300 MILES AN HOUR?

When George Stevenson asserted his ability to run passenger coaches at a speed of twelve to fifteen miles an hour, scientific and practical men deemed him fit for a lunatic asylum, but time has shown that trains may be run at a much greater velocity without materially adding to the dangers of railway travel. The flight of the fast express on the Pennsylvania railway is a marked example of the possibilities in the way of sustaining high rates of speed. This road now runs the fastest train in America. Nine hundred and twelve miles, including seven stops, are accomplished in 25½ hours, and the average time is 36.30 miles an hour. A portion of the distance is run at the rate of 75 miles an hour. At a speed of 60 miles an hour the driving wheels of the locomotive on this train make 258½ revolutions a minute. William Vanderbilt's spurt of 81 miles in 61 minutes on the New York Central is declared to be the highest rate of speed ever attained in this country, but this speed was not a surprise to good engineers, many of whom are firm in the belief that 100 miles an hour will yet be accomplished on American roads.

Thirty-one years ago Colonel Meiggs read a paper before the New York Farmers' Club on "Future Traveling," in which he expressed the belief that railroad cars could be safely propelled by steam at the rate of 300 miles an hour. He said:

"The Emperor of Russia has taken the first great step toward what I deem the ultimatum of railroad travel. Instead of cutting what I call a mere drill through the country and going around everything in the way for a straight line, he has cut a broad way for 500 miles, from St. Petersburg to Moscow. He has made it all the way 200 feet wide, so that the engineer sees everything on the road. This is part of the future: The railroad from point to point with a mathematical line; the rails ten times stronger than are now used; the locomotives on wheels of far greater diameter; the gauge of a relative breadth; the signals and times perfectly settled; the roads on both sides during the transit of trains having the gates of the walls all closed. Then, instead of traveling 100 miles an hour, we shall more safely travel 300 miles an hour."

One of the latest efforts at improvements in locomotives is that of a Frenchman named Estrade, who has constructed an engine which he calls La Parisienne, which, when watered and fired, weighs forty-two tons. Its driving wheels, six in number, are 8½ feet in diameter. The cylinders are on the outside, with valve boxes on the top. The diameter of each cylinder is 7½ inches and the length of stroke is 2 feet and 3½ inches. This engine is built for high speed and will carry a pressure of 200 pounds to the square inch above the atmosphere, or an absolute pressure of 215 pounds. Estrade's engine is designed to run at the average rate of seventy-eight miles an hour.—*San Francisco Chronicle.*

What they Call Improvement in Business in Lowell.

City editor to new reporter—"Well, sir, have you found out anything as to the improved business outlook? We shall want that article to-morrow." Reporter—"Yes, sir; I have learned something very encouraging about two very important industries." Editor—"Very good; what is it?" Reporter—"They tell me that horse-car drivers are working full time, and that the electric lighting stations are running nights.' —*Lowell Citizen.*

The Administration Patent Suit.

The New York *Sun* says: The Pan-Electric imposture, with which President Cleveland has deliberately and gratuitously identified his administration, was thrown out of court by Judge Jackson and Judge Sage at Cincinnati yesterday on the ground of no jurisdiction.

For the administration and its advisers this is a discreditable conclusion of a discreditable case. There was no occasion whatever for bringing this suit, since every point that could possibly be set up in it, and every fact that could be alleged, had already been passed upon in other circuits, and is about to be finally dealt with by the Supreme Court at Washington, where the telephone cases are set down for a hearing at an early day. These facts were well known to the President; but, in order to support his dishonored Attorney-General, he concluded to have this suit brought, and brought in Ohio before a Circuit Judge whom he had himself appointed. It was well known among lawyers that the Bell Company, the defendant in the case, was not a resident of Ohio, and it was not believed that it could there be brought into court; but for the purpose of the stock speculation which the Pan-Electric party had in hand, it was deemed more advantageous to take the chances in Ohio, in the hope that by such means more Pan-Electric stock might be disposed of, and more money realized for the manipulators of the project.

However, the whole scheme has come to nought through the decision of Judge Jackson and Judge Sage. President Cleveland suffers the part of dishonor to which he has needlessly and willfully exposed his administration, while the personal friends he sought to benefit have reaped from his co-operation no real advantage whatever. Meanwhile the interests of the people in the telephone question and the rights of all the parties are safe with the Supreme Court, which will doubtless at an early day bring the whole protracted litigation to a conclusive and final judgment.

About an Arrow.

Editors Electrical Review:

On page five of the REVIEW of November 6, in answer to S. T. Richmonds' query, you say the arrow will represent the direction of the current in the line if any two of the metals named are put in a battery solution.

The arrow should be reversed to represent the direction of a current in the line, but is correct for the direction of the current inside the battery.

Yours etc.,

B. C. WOLVERTON.

Elmira, N. Y.

Buffalo Electrical News.

Editors Electrical Review:

The Rochester folk are still agitated over the telephone question. The mayor has by limitation allowed the resolutions passed by the council to become of effect as far as the council have any power in the matter. On Monday evening the subscribers, 600 in number, formed an association. These 600 out of a total of 1,000 have resolved to order their instruments removed the 20th of the present month, regardless of existing contracts. They also resolved in face of this that any new arrangements with the company must cover the losses they have sustained by a voluntary act of their own by reason of the unexpired contracts.

The present association consists of business men mainly, it is understood, and the remaining 400 of private houses. Negotiations, it is said, are pending to substitute the Dann "make and break" telephone in place of the Bell service.

The Dann machine is a wonderful instrument if one believes reports, surpassing in every quality essential that of the well-tried Bell.

Rochestrans, it is safe to say, will know more of telephony when the present disturbances have subsided.

I visited Syracuse a short time since. The electric lighting service there is rendered by the Thomson-Houston Company. The service is excellent, and gives general satisfaction. They have about 300 Sawyer-Man incandescent lamps running on distributors. At Utica the gas company do the electric lighting, and use the Thomson Houston system. I understand they are preparing to do incandescent lighting on an extended scale.

The Syracuse Company have recently put in their station an Allis (Milwaukee) Corliss engine.

The Sawyer-Man Company have closed a contract with Messrs. Reynolds & Eddy for a 300 light plant to be placed in their new factory.

I hear a rumor of a central station company organizing here to expedite the Edison system.

The U. S. Company are doing quite a business, and have recently contracted to light the new building of the Young Men's Association. H.

Buffalo, N. Y., Nov. 16, 1886.

A New Kind of Glass.

Professor Abbey and Dr. Scott, aided financially by the Prussian Government, have, it is said, invented a new and valuable glass. The ordinary glass contains six substances. The new glass made by Professor Abbey and Dr. Scott contains fourteen. The most essential elements of which it is composed are phosphorus and boron, neither of which is used in common glass. With the old glass the full power of the microscope was the discernment of the one five hundred thousandth part of an inch, and with the new glass it is claimed that the one two hundred and four million seven hundred thousandth part of an inch can be distinguished. When the discovery was first made Carl Zeiss, the manufacturer, in whose place the experimentalists had worked, was in favor of getting out a patent, so that the discovery might prove a most profitable one, but the fact of the experiments having been conducted with funds supplied by the Prussian Government prevented the discoverers from making it a private enterprise, and compels them to make it a public benefit. The difference between the new and the old glass consists in the refraction of light. The glass is not on the market yet, but will be very shortly. It will be used entirely for high power instruments.—*Pittsburgh Dispatch.*

⁂ The National Electric Company has moved its general offices from Chicago to Elgin, making a branch office of the Chicago office.

ELECTRICAL REVIEW

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, NOVEMBER 27, 1886.

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What funny fellows those telephone subscribers in Rochester are. They formed an association to protest, and if possible to prevent the company from changing its method of collecting rentals. Nearly everywhere the telephone people are berated for making no discrimination between the rental for a residence telephone where there is a deaf lady and one Irish maiden, and another homestead where there are half a dozen voluble young ladies; or in business leases between a corner retail grocery and a wholesale lumber concern. In Rochester, where the company proposes to equalize all that sort of thing they—speaking metaphorically—kick. Investigation will show that the kickers are those who will have to pay more, rather than less rentals under the new arrangement. That class of customers never will withdraw. The change will be made, and they will growl, but they will stay and pay.

It is highly creditable to the president of the American system of lighting that his efforts in behalf of the lighting of the Statue of Liberty were successful. Mr. Goff's visit to Washington and conference with the Government officials effectively cleared away the official red tape, and as a very gratifying result to the entire country, the Goddess is again lighted.

Inquiry among compositors in newspaper offices in New York shows much satisfaction as to the hygienic influence of incandescent electric lighting over gas. Much more work, with less fatigue to the eyes, is accomplished by printers now than before in the same establishments, and they particularly remark the lessened tendency to headache, which is not uncommon in such operatives.

The Pan-Electric speculators are in a quandary. They brought their suit in Ohio because they thought they would get a more favorable hearing there than anywhere else, but the Ohio judge has declined to try the case, and they do not know where to turn next. If they bring their case in Massachusetts they will have to bring it before judges who have already decided all the chief points at issue in favor of the Bell Company. It is a bad business, and the courts hate to touch it.

Of the common notion that electricity plays an important part in the production of earthquakes, Professor Joseph Le Conte well says: "I never heard or read the slightest scientific proof of this theory. Electricity has taken hold of the popular imagination, so that any inexplicable thing is explained by electricity. For example, vital force, nerve force, etc., are inexplicable, so many lay it to electrical force. So also with earthquakes—electricity is made the scapegoat."

In accordance with the action of the board of overseers of Harvard University, the faculty have adopted a new set of requisitions for admission. The minimum science requisition calls for physics with laboratory work. This will give an impetus to practical work in electricity and its applications in large numbers of high schools. A list of 40 experiments is published with references to Pickering's Physical Manipulations, Gage's Physics, Trowbridge's New Physics, Worthington's Introduction to Laboratory Work. If the instructions are followed there will be more real benefit from the school work in electricity than is now the case.

The acting president of the Consolidated Telegraph and Electrical Subway Company, of this city, has resigned, and this organization is again without a head. Having received the contract for putting all the wires of New York underground there would seem to be no reason why a responsible man should refuse to act as the efficient head of the company. As another discouragement, a Mr. Wm. McMahon, of New Jersey, has commenced suit against the company for $250,000, claiming this amount on an agreement with the early promotors of the company. The work of burying the wires in this city has so far been productive of nearly everything else except putting the wires underneath the surface.

A NEW THEORY OF ACOUSTICS.

Dr. W. Rutherford, F. R. S., and Professor of Physiology in the Edinburgh University, has advanced a new theory of acoustics, which he appears to have arrived at through philosophising on the telephone and its communication of sound vibrations.

In the course of a recent lecture on the subject, after illustrating the difficulties and inconsistencies of the accepted theory of sound sensation, he said, before substituting another theory, he would pay a humble but sincere tribute to that genius of Helmholtz, whose magnificent services to science had long since placed his name among those of immortals.

Some five years ago it struck the lecturer that the case of the telephone might throw light on these difficulties regarding the sense of hearing. When sound-waves fall on the plate of one of the telephones it vibrates The vibrations of the iron near the magnet affect the magnetism, and so induce in the wire currents of electricity, whose frequency and amplitude correspond to those of the vibrations of the iron produced by the sound. The currents travel to the second telephone and induce oscillation of the magnetism, which in turn causes its iron plate to vibrate and produce sounds similar to those communicated to the first telephone. There is no analysis of the sound-waves. The transmitting telephone takes up simple for complex vibrations. The harmonies of an orchestra may fall upon it, and it does not fail to convert the complex sound vibrations into electrical vibrations, and these again into the complex sound of the orchestra in the receiving telephone.

The theory which the lecturer had arrived at, and which he published that night for the first time, might be termed the telephone theory of the sense of hearing—the theory that the cochlea does not act on the principle of sympathetic vibration, but that the hairs of all its auditory cells vibrate to every tone just as the drum of the ear does; that there is no analysis of complex vibrations in the cochlea or elsewhere in the peripheral mechanism of the ear; that the hair cells transform sound vibrations into nerve vibrations, similar in frequency and amplitude to the sound vibrations; that simple and complex vibrations of nerve energy arrive in the sensory cells of the brain, and there produce not sound again, of course, but the sensation of sound, the nature of which depends not upon the stimulation of different sensory cells, but on the frequency, amplitude, and form of the vibrations coming into the cells, probably through all the fibers of the auditory nerve. On such a theory the physical cause of harmony and discord is carried into the brain and the mathematical principles of acoustics find an entrance into the obscure region of consciousness. Now, if nerve energy were only electricity, that theory would probably be accepted at once, but nerve motion is very sluggish when compared with electricity.

BOOK REVIEW.

UNITS AND PHYSICAL CONSTANTS." J. D. Everett, M. A., D. C. L., F. R. S., F. R. S. E., Professor of Natural Philosophy in Queen's College, Belfast. Second edition, 1886. Macmillan & Co, New York and London.

The first edition, published in 1876, was very favorably received, and was exhausted two years ago. The changes and additions in that portion of the book relating to electricity are on magnetic susceptibility, magneto-optic rotation, Greenwich magnetic elements, ratio of the two units of electricity, specific inductive capacity, practical units, gauge and resistance of wires, electromotive force of cells, etc. A few typographical errors have found their way into the text. For instance, the values of the E of fire material on p 72, the decimal (?) multiple is given as 11^{12} instead of 10^{12}, as it obviously should be. Great care has been used in bringing the data down to date, and its handy arrangement and its comprehensiveness make it a desirable companion for all electricians.

"GUIDE TO ELEMENTARY CHEMISTRY FOR Beginners. LeRoy C. Cooley. 1886. Ivison, Blakeman, Taylor & Co., New York and Chicago.

This is a neatly printed text-book of 300 pages, by the Professor of Physics and Chemistry in Vassar College. The cuts are new, made from photographs of the apparatus actually used. An attempt has been made to explain the simple principles of the science only. An elementary knowledge of chemistry is necessary for a thorough knowledge of many electrical phenomena, and this is certainly a useful manual—clear, simple in language, full in explanations, and filled with simple, instructive experiments, which may be performed with inexpensive apparatus and chemicals.

Cleveland is now discussing the question of an underground conduit for all her electric wires.

CHICAGO ELECTRICAL NEWS.

It has come to be the fashion to do nearly everything by electricity nowadays. The "charging" of all sorts of receptacles with electricity, from a storage battery to a laborer's daughter, has become so common that there is no longer any chance for a patent or other protection against infringement. As a result, an enterprising, horny-handed husbandman on Harden's Creek, near Sharon, Ga., guided by that sort of utilitarian philosophy which would "hit if it was a deer, and miss if it was a calf," went with a shovel to hunt gold in a bank—a sand bank—thinking, like the nigger with the lottery ticket, he knew he wouldn't draw anything, and that made him think perhaps he would—so he bought—and what he *knew* proved better than what he *thought* about it.

Well, the ingenuous old innocent, with that large and indiscriminate trust in all mankind which is the marked characteristic of the honest granger, had taken with him to aid in his labors an ignorant previous-condition-of-servitude, who was sadly afflicted with chronic rheumatism.

The pit in which they were digging was filled with an "oozy clay," and the previous party, above mentioned, appeared to be predestined—contrary to the usual inclination of that sort of person—to play in the "oozy clay," and was surprised to find that his "rheumatics had done gone lef' him."

Of course the spot is in a dense thicket of an almost impenetrable growth of laurel, and difficult of access, but they get there all the same; and the simple-minded old granger is probably turning his mud into gold without digging for it.

The printed explanation of the curative properties of the "oozy"—an explanation which, as clear as the mud itself, is that it is charged with electricity." The coming explanation will probably be found, when, by and by, the "Sharon Electric Ooze,' for the cure of ——, etc.," will be for sale by all druggists, "the wrapper bearing the signature of the proprietor as a test of genuineness."

The Associated Press dispatch of the 17th from that misguided suburb of Buffalo says that "people on the streets to-day are wearing small steel telephone plugs as badges, indicating their opposition to the Bell Telephone Company. The excitement here has culminated by the Subscribers' Association issuing a notice requesting that all the steam whistles in the city be sounded at noon Saturday, as a signal that the use of the telephone service has ceased. The big fog horn on Kimball's tobacco factory will open the concert. There are about 700 telephones in the city. Of these over 600 instruments are represented in the Subscribers' Association, and every man has pledged himself to discontinue the use of his 'phone Saturday, whether his telephone is or is not taken out. It is an actual case of boycott."

Who was that mythological individual who bit his own nose off to spite his face? Or was it some one who lived in the town made famous made by Sam Patch's exploits?

Speaking of telephones, the latest fad in this direction is a system where the ringing up of the other fellow by a magneto energizes the electro-magnets, and thus enables the system to work without battery. It is a new idea certainly—this making a storage magnet of an electro-magnet. Parties here claim that they have talked over a metallic circuit twelve miles out and back, twenty-four miles, without battery and without induction, and the gentlemanly agent blandly remarked that he had no doubt it would work just as well a hundred miles. Perhaps he believed it, but he was thunderstruck when he learned that his twenty-four-mile experiment was a puny weakling compared to what had been done by others without any return wire.

Of course the no-battery-but-magneto-rejuvenated system is one of those where the instruments are sold outright—not leased. Mr. Man buys a pair, takes them out to Hoop-pole or Shortlumber township, sets them up,

and they do his business from house to store or the women's talk between mother's and Nancy's, and the agent pockets his money. What do they care about the Supreme Court or the Indiana legislators?

The lights on our Board of Trade, of which mention has been made recently, are causing considerable talk.

In an interview a few days since, Mr. Sperry stated that the expense of maintenance of the 20 lights was $2,100 per annum. This amount, at the time the corona was placed, it was understood, would be borne by parties interested, among others, the Union League Club, the Grand Pacific Hotel, the Counselman Building, the Royal Insurance Building, the Rock Island and Lake Shore railroad companies, who have a joint depot on Van Buren street, back of the Board of Trade, the latter corporation finishing the power. There was also a tacit understanding with the gentlemen who at that time filled the offices of Chief of Police and City Comptroller, that they would assist in any reasonable manner, to get the city authorities to assist in defraying the expense of maintenance. These two gentlemen are no longer officers of our municipality. The former is superintendent of a street car system, while the latter has been gathered to his fathers.

A petition has been presented to the Council signed by the original parties to the contract named above, and it is hoped that the City Fathers will open the municipal purse strings to the tune of about one thousand dollars per annum, and this will enable the enterprise to be continued. The petition and its appurtenances was turned over to the committee on gas.

The storm of the 17th and 18th was as widespread as it was severe. It was extremely heavy and destructive throughout the entire Northwest, the lake region being especially marked for mishaps. At Marquette, Mich., the breakwater was nearly all swept away, and the rolling mill dock went also. Three vessels were wrecked. Other vessels suffered more or less, being incapable of keeping their courses on account of the blinding snow. From every port along the lakes come the same sort of intelligence—wrecks, misery, death. At one time the velocity of the wind at the crib, two miles out in the lake, was reported by Captain McKay, the crib keeper, at seventy-five miles an hour, but the signal service instrument only claimed twenty-five. The barometer mercury fell to 29.41 inches, and the temperature dropped to 27°+, and the moisture precipitation amounted to .48, the equivalent of five inches of snow.

At the Baltimore & Ohio telegraph office the storm was credited with delaying business from one to four hours. The trouble was chiefly east of Buffalo, on the Lake Shore route, and east of Baltimore, on the Baltimore and Ohio route. Wires were not broken so badly; but, as a newspaper reporter had it, "the high winds oscillated them to such an extent that they were almost unworkable." The Western Union wires were not oscillated quite so badly, as they were reported working fairly. At the Mutual Union office the Eastern wires were said to be in bad condition, particularly in Pennsylvania, where a combination of hail, sleet and wind worked jointly for their discomfiture. Western and Southern wires, all round, were in quite fair condition; but the Eastern lines, and those reaching Canadian points, were all more or less out of fix. What is peculiar in this instance is that very few wires were broken; and as soon as the "oscillations" were quieted down, the accumulated business was at once worked off. West of us the demonstration was largely one of heavy snow, and drifts accumulated everywhere, in some cases blockading trains for the time being, which were relieved at once, when the storm quieted down. The cattle men claim to have no fears of loss, as they were all prepared for severe weather.

CHICAGO, Ill., Nov. 22.

BOSTON ELECTRICAL NEWS.

Dr. Harold Whiting, instructor in physics, Harvard University, proposes to arrange connections so that the clock beating seconds (regulated from the Harvard observatory) may regulate a ½ second pendulum and that a $\frac{1}{32}$ second pendulum. The last will control a tuning-fork vibrating 64 times per second. If desired the latter may regulate a tuning-fork vibrating 2 or 4 times as fast. For chronograph determinations we have now a reliable and definite standard by which to compute the deductions from our observations.

At a recent meeting of the stockholders of the Boston Consolidated Railroad a report of the directors was submitted, containing a suggestion "that it is desirable for the company to make an early movement in the substitution of other power in the place of horses," and that a committee appointed to consider the matter will make a definite report in the course of a few weeks.

The condition of matters in Winthrop regarding the building of the electric railroad on the Enos system is as yet unchanged. The local company seems disinclined to carry out the spirit of their charter, and no action can be taken against them by the parent company for a year and a half, that is, until the limit of time in their charter expires.

The resistance of one mile (nautical) of submarine telegraph cable is for Red Sea cable 7.79 ohms, second Atlantic, 4.19 ohms.

The alloy platinoid (made of German silver with the addition of a little tungsten) varies in resistance with a change of temperature only half as much as German silver. It is therefore more useful than German silver for resistance coils.

The underground system of the Edison Illuminating Company is being rapidly pushed; the trench on Tremont street as far as West street is complete with 6 large cables, the copper of each being as large as a broom handle. The cables are composed of a large number of small wires protected with calendar insulation. They are flexible when laid are uncoiled from drums. Every two feet in the trench insulating supports having 3 slots, one for a cable, are placed. The cables when placed in these slots are covered with an insulating water-tight and gas-tight substance. The trench when filled to the top is covered with a board chemically treated. The trench is laid about 18 inches below the level of the street. A double nought 3 wire main is being laid in Boylston street. The foundation of the 20,000 light extension of the central station is slowly progressing, and it is expected that the present capacity of the station, 3,000 lights, will be doubled by the first of January next.

The axle of a railway car moving at the rate of 60 miles per hour, the distance between the rails being 4 feet 8½ inches, generate a current having an electromotive force of $\frac{1}{100}$ of a volt. If the cars were 6,000 times as broad the current would have an E.M.F. of 10 volts, sufficient for train lighting. The axles in that case would have to be divided and insulated. Sufficient current would be generated, which, stored in secondary cells, could be employed for an arc locomotive head light. Instead of expensive braking apparatus at present in use; it would be only necessary to have large copper strips running across the cars and placed so that they might be put in contact with the wheels or track; the immense current generated would stop the trains in an extremely short time.

In the above we have assumed as a field of force only the earth's field, and no regulating apparatus would be required. In the same field a coil having 3,000 turns of wire, the diameter of the coil being 300 cm., revolving 600 revolutions per minute about a vertical diameter, a current with an electromotive force of about 250 volts would be generated. "A dynamo without field magnets"—at least without visible ones.

BOSTON, Mass., Nov. 23.

Rules to be Observed in Handling Electric Currents, as Used in Electric Lighting and Transmission of Power.

PAPER READ BEFORE THE ELECTRIC CLUB OF NEW YORK, NOVEMBER 4, 1886, BY DR. GEO. H. BENJAMIN, OF NEW YORK.

The rules which I would submit to your consideration are as follows, and have been compiled after a careful examination of those of all the fire-boards and underwriters associations of the world. I have endeavored to make them as concise and clear as possible, and with the intention of providing as few onerous conditions as are compatible with absolute safety to life and property.

Such rules are comprehended under the headings:

1. Rules to be observed in conveying currents of considerable quantity or electromotive force in and through buildings.

II. Rules to be observed in locating and constructing aerial and underground conductors.

III. Rules to be observed to prevent accidents to life or bodily injury.

I—RULES TO BE OBSERVED IN CONVEYING CURRENTS OF CONSIDERABLE QUANTITY OF ELECTROMOTIVE FORCE IN AND THROUGH BUILDINGS.

RULE I.

The degree of E.M.F. that may be employed in an electric circuit within any building should not exceed 100 volts for alternating currents, or 300 volts for continuous currents. No departure will be allowed from this rule except by special permit, and then only for arc installations in large buildings where the whole plant is absolutely removed from public interference.

RULE II.

The conductivity of all wires should be such that 100 per cent. more current can be transmitted through them than that estimated as their proper carrying capacity, without increasing their temperature above 150° F.

RULE III.

No naked conductors allowed in buildings.

RULE IV.

All light and power circuits must be entirely metallic and of properly insulated wire. The employment of gas, water or steam pipes, or the earth as a part of circuit is positively prohibited.

RULE V.

All conductors should be thoroughly well insulated with a material or materials as noninflammable as possible, and which will not fray or become loose, melt at a low temperature (below 150° F.) or absorb moisture.

RULE VI.

All conductors that are exposed to moisture must be provided with a waterproof insulating covering.

RULE VII.

Where practicable, all conductors in factory or similar buildings should be so placed as to be readily inspected and tested.

RULE VIII.

No conductor, whether bare or insulated, shall be laid in wet cement, plaster, mortar, or other similar material.

RULE IX.

All conductors carried through or within walls, floors or partitions must be inclosed in separate metal, earthen ware, terra cotta or asbestos board tubes, or their equivalent, and which should be slightly larger in their inside diameter than the conductors they are designed to carry. Conductors should not be placed above each other in such a manner that water could make a cross connection.

Especial care should be taken to protect all concealed wires from mechanical injury.

RULE X.

Conductors conveying currents of considerable E.M.F. or quantity, as for arc-lights, power, charging of storage batteries, and the like, excluding secondary distribution, should be placed at least 6 inches apart, the same distance from conducting bodies, and at least 2 feet from other wires of smaller diameter placed parallel therewith.

(Continued on eighth page.

Oxidized silver can be made bright and clear by boiling it in a solution forty parts water and one part sulphuric acid, or by gently heating the article and dipping it into the solution.

SOLDER FOR PLATINUM.—Platinum combines very readily with zinc, arsenic, and also with tin and other metals—so much so, that it is dangerous to melt either of those metals in a platinum spoon, or to solder platinum with common tin solder, which fuses at a very low temperature; although platinum is constantly soldered with fine gold the melting point of which is very high in the scale. When copper is soldered and the solder to be colored like the surrounding copper, this can be done by moistening the solder with a saturated solution of vitriol of copper and then touching the solder with an iron or steel wire. A thin skin of copper is precipitated, which can be thickened by repeating the process several times. If a brass color is desired, a saturated solution of one part of vitriol of zinc and two parts of vitriol of copper is used on the previously coppered solder and the latter rubbed with a zinc wire. To gild the soldered spot, it is first coated with copper in the manner indicated above, and then with gum or isinglass and powdered with bronze powder. The surface is obtained, which, after drying, can be very brightly polished.

The cross sights of surveyors' instruments are now largely made of platinum wire. The wire used for this purpose is drawn to a diameter of about one twelve-thousandths of an inch. To accomplish this, fine drawing platinum wire three-thousandths of an inch is covered with silver, bringing the diameter to one-tenth inch. This is then drawn so as to give the diameter of platinum core required, then the silver is eaten off with acid, leaving the platinum wire.—*American Machinist.*

HOW MUCH OF THE CURRENT IS CONVEYED BY THE WATER AND HOW MUCH BY THE DISSOLVED SALT IN ANY GIVEN CASE.—To answer this question it seems to me sufficient to determine the amount of free acid generated at either pole, and to compare it with the amount of metal deposited in the same time by the same current. For instance, with copper sulphate solution and platinum electrodes. If the salt conducted the whole current, one equivalent of free acid would be produced at the anode; if water conducted the whole, one equivalent of free acid would appear at the cathode. It is easy to see this by drawing the section of a cell and considering its action; and so, by determining the proportion of free acid which actually does appear at either pole for given strength of solution and intensity of current, it is easy to reckon how much of the current is by each substance conducted. It is obviously necessary to diminish diffusion between the cathode and anode vessels, and to avoid electric endosmose and the use of porous diaphragms. It is also probably advisable to stir or scrub the surface of both electrodes, so as to avoid a layer of some other liquid forming there, and so confusing the whole reaction. Migration data, if explained in the way I suggest, will also give a determination of the proportion of current conveyed by salt and by solvent; and it will be interesting to compare the two methods of determination, and see if they give the same result. If there is a discrepancy, as is very probable, it will be necessary to examine its cause, and to see whether it wholly upsets the suggested migration hypothesis, or only entails some slight modification.—*Prof. O. J. Lodge.*

Telephonic News

*** Negotiations are said to be pending in Rochester to substitute the "Dann make and break" telephone for the Bell. We fear there will be found to be more "break" than anything else in this case.

*** The horse of Mrs. Ann Diment, of Madison, Wis, tripped over a sagging telephone wire, a runaway followed, and Mrs. Diment and a companion were seriously injured. The Wisconsin Telephone Company, which owned the wire that caused the runaway, has just compromised by the payment of $3,000.

*** The manager of the telephone exchange at Atlanta, Ga., Mr. W. T. Gentry, has returned South after a visit to Northern cities, looking into the larger exchanges and inspecting telephone work in the North. While Mr. Gentry found much to interest him, we doubt if he saw any city with a better record than that of his own Atlanta, where he controls one of the most satisfactory telephone exchanges in the country—satisfactory to patron as well as to the Southern Bell Company, in whose territory it lies.

*** Edward J. Hall, Jr., general manager of the American Telephone and Telegraph Company, of New York, states in an interview in Rochester that the company will next season construct a long distance telephone line from New York to Buffalo. Mr Hall says that the New York and Philadelphia line now ready for operation works even better than short distance lines, and that the problem of long-distance telephoning has been solved. The company is pushing work on the construction of its line from New York to New Haven, Providence and Boston.

*** There has been a very satisfactory change and improvement in the telephone business at Scranton, Pa., the multiple system taking the place of the old style switchboards. This is the fifth time that the central office switchboards in that city have been changed to make room for more extensive and improved apparatus. Pittsburgh and Scranton are the first cities in the State to adopt the new system. The telephone company is evidently determined that the service at Scranton shall be first-class in every respect. The manager at Scranton, Mr. T. J. Jennings, is a capable telephone man, and is now at the head of an exchange that will compare in excellent service and arrangement with any exchange of its size.

*** An interview with Mr. John I. Sabin, vice-president and general manager of all the Pacific Coast telephone business, who returned last week after a visit of two weeks with eastern friends, discloses the fact that telephone growth is still a conspicuous feature of electrical affairs in that section. He has decided that San Francisco shall have the benefit of all the latest improvements in telephone service, and will at once put in the improved multiple system of the Western Electric, and will probably consolidate three exchanges into one, making a total of about 2,200 subscribers. Two miles of the Faraday cable—50 and 100 wire—will be used. San Francisco is to be congratulated on having such enterprising men as Messrs. Sabin and Ladd at the head of the telephone business there, and the subscribers will undoubtedly receive much benefit from the improvements that have been decided upon.

*** Mr. Russell A. Dennison, of Providence, R. I., has an underground system in which the tubes are made of asbestos and the insulation or packing intervening is of ground mica and asphaltum, while the outside is concreted with mica and obituam. The conduits are said to have been patented and constructed after specifications required by the New York Subway Commission and their electricians and experts. The mechanical work of construction is done by resting the ends of the conduits on piers terminating in the caissons set about twenty-five feet apart, and with jointures, so that any service can be easily tapped and led into a building. The cost to each company, providing four conduits are put in position, will, it is said, not exceed $7,500 per mile for each conduit, or $30,000 per mile for the four systems—telegraph, telephone, electric light, and fire alarm, and each conduit will carry 150 wires to the square foot, and each conduit can in future be enlarged in capacity without taking up. Claims of high insulation are made, of durability and imperviousness to heat, cold or moisture.

*** The Cincinnati *Star* says: "All poles, cables and wires necessary for the consolidation of the exchanges are completed. Over 600 miles of new copper wire in cables and on sixty-five-feet poles have been used, and a corresponding number of miles of old forty-five-feet poles, iron wire and cables, will be taken down. At the present time the current is flowing over both the old and new wires, which accounts for the trouble experienced by subscribers. So soon as the subscribers are transferred to the new exchange, the old wires will be detached from the new, and the old poles, cables and wires taken down. The taking down of the old plant will not interfere with the service. Captain Stone is very positive everything will be in readiness for the transfer to the new exchange not later than the 20th. The first pole for this change was erected on the 15th of July. Considering the amount of work, both inside the exchange and on the streets, necessary to make this change, it has been put through with a rush, and beats all previous records. In a very few days Cincinnati can boast of having the best telephone exchange and system in the world.

Elocution Over the Telephone.

A young gentleman, a resident of Oshkosh, who had been paying attention to the art of elocution and a sweet young lady at the same time, decided to recite for her edification the following beautiful lines, and made use of the convenient telephone between his office and her father's residence:

'Tis the last rose of summer
Left blooming alone;
All her lovely companions
Are faded and gone.
No flower of her kindred,
No rosebud is nigh,
To reflect back her blushes,
Or give sigh for sigh.

This was reproduced in the young lady's ear as below, and she now declines to have anything to do with a man who recites for her in such a condition of incoherency:

'Tisselash oesher slummer
Lef' bloom-loan;
Aller luv'panjuns
Fay-fay-jun gone.
Naw flowrer kinjub,
Naw rosh-bud ish ni-i-i-i,
To reflush backer freckles,
Or give shy for shy.

Underground Telephone Wires.

The rapid increase in the number of telephone, telegraph and electric light wires within the last few years has demonstrated the necessity of having them placed underground, for not only do the poles and network of wires disfigure the streets, but in case of fire they seriously interfere with the work of the firemen, while a severe storm may greatly damage the whole telephone and fire-alarm system, and leave in darkness those sections of the city which are dependent upon electric lights.

It is encouraging to learn that that the New England Telephone Company is expending about $40,000 in Boston in placing its wires underground. On Berkeley street, from Providence to Beacon street, a conduit has been laid for six hundred wires, and two hundred wires of that number are already in use. This will enable the company to remove the poles now standing on Copley square and other parts of the Back Bay.

Another line which is being placed underground connects with the old underground system, which leads from Pearl street to the corner of Franklin and Arch streets, and runs through the intervening streets to and including Tremont street, past the office at No. 450 Tremont street, and extends to Pynchon streeet. This avoids the necessity of setting a line of poles on Tremont street, as had been contemplated. A. C. B.

Telephone Inspector's Tool Box.

Neat Box of Electrical Tools.

A correspondent inquires concerning a suitable box of tools for small experimental work. The collection illustrated in this issue, manufactured by the Western Electric Company, will probably answer his purpose. The collection is known as a telephone inspector's set, and is specially arranged for work with the telephone, and besides is well adapted for small electrical work, containing pliers, screw-driver, nippers, file, oil-can, etc.

Ohio Courts Decide that Highways Are the Property of Land-Owners.

A special from Warren, Ohio, says:

Judge H. B. Woodberry, of the Circuit Court, in session here, decided this afternoon one of the most important questions in Ohio courts by this decision: "No corporation operating a telephone or telegraph line can plant poles along highways without having first paid abutting land-owners for the privilege." The suit is John J. Smith, of Champion, a farmer, against the Central District and Printing Telephone Company, of Pittsburgh, Pa. The company, in 1885, planted its lines along the highway abutting Smith's farm without paying for the right.

The case was decided against the company in Common Pleas Court, and came from there to the Circuit Court. The plaintiff claimed that the company had no right to plant the line without first appropriating the property. He claimed a fee simple in the highway to the middle of the road, and that the fee was disturbed. The defendant claimed the right, as the plaintiff had no right to interfere with any assessment in the road for a public benent. The Court gave a lengthy opinion, ordering the company to take their poles down inside of ninety days, and granting $1 nominal damages.

A Telephone Manager Arrested.

Manager John O'Minger, of the Hudson River Telephone company's office at Amsterdam, was arrested last week on complaint of General Manager Uline, of the telephone company. O'Minger was said to be short in his accounts to the amount of $200. O'Minger was given a chance to settle, but failed to do so. He is held pending an answer from his parents at Schenectady, who have been appealed to for the amount by their son. This is the second manager of the Amsterdam exchange who has been in trouble with his accounts during the last year.

*** It appears that up to the present time about 10,670 kilometers of telephone lines have been erected in Russia, of which about 4,000 kilometers are in St. Petersburg and about 3,000 in Moscow. The number of instruments in use is not stated.

A Telephone Consolidation.

THE MISSOURI AND KANSAS TELEPHONE COMPANY BUY OUT THE UNITED TELEPHONE COMPANY.

At a meeting of the directors of the Missouri and Kansas Telephone Company, held in Kansas City, they voted unanimously to increase their capital stock $250,000, and to buy the plant, franchise and stock of the United Telephone Company at $210,000, and to pay for the same out of this increase of capital stock. The United Company is the company owning and running most of the telephone exchanges in Kansas. This company was started three years ago with a capital stock of $600,000, the original stock going to par soon after organization. This sale does not indicate that they have made much money. It is understood that the directors of the United Company have voted to accept the proposition, and go out of business. The latest sale of Missouri and Kansas stock was at 70 cents.

Mr. John R. Mulvane, president of the Missouri and Kansas Telephone Company, returned last evening from Kansas City, and from him the above information was learned.

Mr. Mulvane states that the capital stock of the Missouri and Kansas Telephone Company is now $1,125,000. By the purchase of the rights, franchises, etc, of the United line this company has acquired a valuable piece of property.

The United line controlled all the lines in Kansas, excepting the counties of Atchison, Shawnee, Jefferson, Leavenworth, Wyandotte and Johnson. They also controlled a section of territory in southwestern Missouri known as the Springfield district. The new company will employ 163 hands, all told; the capital is all paid up, about two-thirds of it being Eastern.

Mr. Mulvane has also been giving the subject of an electric motor to be used to propel a street railway, some consideration and attention within the past few months. He states that as soon as the question as to the practicability of the use of this motor for street railway purposes is definitely settled, a company with which he is connected will at once take hold, and see that Topeka is supplied with one.—*Topeka* (Kans.) *Commonwealth.*

Using the Telephone to Defraud.

Charles A. Biller, age 24, noted as a swimmer and saver of people from drowning, was arrested in Newark last week on a charge of fraudulently procuring $300, the complaint being made by T. & J. Feary, of Newark, by whom he was employed as book-keeper until about three months ago. The Messrs. Feary conduct the business of the telephone company in Newark. Biller asserted his innocence. Mr. John Feary states that on last Friday he was called to the telephone by some person who said he was in the office of the Hyatt Filter Company in Newark. The person requested that a telegraph order be sent to New York for $300 for John W. Hyatt, to be made payable to Alexander Grant. The order was sent.

Mr Feary then learned that Mr. Hyatt had not authorized the telegram. He was visited by John P. Delaney, a jeweler of No 2 Astor House, this city, and shown a check for $300, Mr. Delaney stating he had lost that amount by the check. Delaney said that Biller represented himself as Alexander Grant to persons in New York after the telegram had been sent, and was required to get some person to identify him. He went to Mr. Delaney, from whom he had bought valuable jewelry, and the latter, who did not know Biller's real name, consented to identify him. He went to the telegraph office and gave the necessary assurance, and the check was given to Biller. Another difficulty occurred when the cashier of the bank refused to cash the check until the holder was again identified. Delaney says that Biller thereupon returned to him and that he indorsed the check and sent Biller to his, Delaney's bank, to get the money. Mr. Feary said that Biller was well acquainted with the telephone service, and that when the discovery was made that the telegram was fraudulent, suspicion fell upon him at once. Police Justire Roder said that as the offense had been committed in New York he could not act. Biller was held until the papers could be got for removing him to this city.

A Righteous Judgment.

The opinion of the New York *Mail and Express* on the Cincinnati telephone decision is given in the following pointed and able manner :

The United States Circuit Court has materially injured the market price of Pan-Electric stock. It has decided that the American Bell Telephone Company cannot be sued in a State where it simply owns the instruments used by local corporations in conducting their business. This is a hard blow to Garland, and seriously damages the property to which he clings with a tenacity that cannot be shaken by the disgrace which his ownership brings upon the administration.

For some reason the Pan-Electric people, who not only induced the Government to begin this suit, but who controlled the choice of the court before which it was begun, objected to trying the issue in Massachusetts, the home of the Bell Company. The Government was put in the position of doubting the integrity of its own justices of the First Circuit. The residence of the company was in Massachusetts and its officers lived there. The chief of the circuit is Justice Gray, who for some years was Chief Justice of the State, and who is known as a learned jurist and an upright judge. No stain has ever been found upon his ermine, and no suspicion of his integrity has been breathed. His associates are less known, but their reputations are high in the communities where they live. When the Government counsel chose to bring the action in the Sixth Circuit they insulted the judges of the First Circuit. They exhibited an animus such as only parties in interest and their attorneys should possess. We do not mean to reflect on Judge Baxter, who is now dead, but it was evident that his circuit was chosen for the venue because of his reputation as a "patent smasher." The Government's counsel expected that he would listen to the presentation of their cause with more sympathy than the Massachusetts judges might show.

This might have been expected from counsel for the Pan-Electric, but the Government is not presumed to be interested in the fortunes of that speculative concern. The Government, to use the strong figure of Secretary Lamar, was simply interested in discovering if its justice had been violated and if its seal should be torn from Prof. Bell's patent because it had been obtained by fraud. It should not have sought a court because of the peculiar opinions or prejudices of its presiding judge, but should have called the defendants into the court of its residence. If the Government doubts its judges, who shall honor its justice? The action of its counsel in selecting Cincinnati and avoiding Boston was that of attorneys for a tricky client who seeks more or less than equity—who is unwilling to stand on an equal footing with his adversary.

The question was, shall Prof. Bell's patent be taken from him because it was obtained by fraud? It was between the United States and the defendant corporation. What incidental or indirect interest the Pan-Electric had in the matter was not the concern of the United States, and yet the lawyers employed by the Government, in selecting the place for bringing the action, did precisely as if they had been employed by the Pan-Electric, and as if they represented a client having a pecuniary interest in the decision of the court. This added to the disgrace of Garland's connection with the company. The Pan-Electric was organized for the purpose of making Rogers' patents valuable by means of the kind offices of the federal Government; and yesterday's decision of Judge Jackson is the first check with which the conspirators have met. One of them was appointed Attorney-General, and his department was used for bringing a suit to annul the Bell patent. Counsel were appointed who seem to think that their first duty is to the Pan-Electric instead of to the Government, and the suit was brought in a jurisdiction supposed to be friendly not to the Government, which is the real plaintiff, but to a speculative beneficiary. Judge Jackson's decision sends the Government to its court in Massachusetts. Let it go there as the Government, and not as the agent of the Pan-Electric Company, if it does not see fit to drop the whole wretched business. If it doubts any one of its judges of the First Circuit the President should say so openly. Neither he nor his attorneys should cast a suspicion upon the court. He should realize that, above all else, it is his duty to preserve the confidence of the people in their courts of justice.

So-Called Telegraph Schools.

If newspaper warnings were ever heeded, the institution called a school of telegraphy must certainly have gone to the wall "years and cheers ago," as Mr. Florence puts it. But the trouble lies beyond this sort of exposé. The newspaper does not seem to reach the "gull" until the poor fool has bitten at the bait and is hooked.

One of our daily sheets took a whack at an institution of that kind here, the other day, and showed up the fraud in excellent form.

The concern in question is one of the chronic deceptions of the city, and from its age and persistency in maintaining its place, must be well patronized. It constantly wants a few "young ladies to learn telegraphy for our lines, situations, $60, $70, $80, $90.

The newspaper man set up a job on the concern and sent some eager damsels up to interview the great mogul of the shop. The reporter says :

Certain young ladies did as they were advised, and entered the ante-room of "The Union School of Telegraphy."

"A young man sat in the corner tinkering with a machine, and whenever he was asked if the superintendent was in he arose, crossed the room (to where the lord chancellor couldn't hear him), and seating himself in an arm-chair allowed the applicant to infer that he was the superintendent. He then informed the young applicant that the tuition fee was $35, which, excluding the cost of the manual and some specified material, covered all expenses. It took between three and four months to learn the trade, at the end of which period the company would undertake to secure all graduates from the school situations. Situations, he affirmed, were never lacking for good operators, but of course there was difficulty in securing a place for a "plug." Situations could be had in the city if preferred, and the sort of work left to an extent to the choice of the graduate. There was social telegraphy, and commercial telegraphy, and theoretical telegraphy, and practical telegraphy. Some young ladies preferred social telegraphy. This appeared to be a branch of the business which allowed the young lady operator to spend her evenings out. It didn't pay so well—only about $65 per month—but then one couldn't expect to step into a $150 place right at the beginning."

Inquiry at the Western Union and the Baltimore and Ohio offices revealed the fact that the best class of operators are paid $80. The average is about $55 to $60, while on the Metropolitan lines where any number of dots less than nine are used indiscriminately to represent H. P. or 6, and spaced letters are comparatively unknown, the unfortunates are many of them paid as high as twenty dollars a month. Some of these are of a class who, if their salary would only permit, would be quite fast operators.

In the school alluded to, the method pursued is what is called the g. b. After a poor devil or deviless has pounded away for a specified length of time the "lord high executioner" decides that he or she is a failure, and—pht-t-t, the individual disappears. If there are friends and backbones to make a fight, why, a compromise is effected and part of the money is refunded—but generally the bitter pill of disappointment is swallowed and the pupil looks up a half interest in some other fraud or disappears in the scum of the city's whirlpool.

One of the victims applied at a telegraph office here the other day, believing himself capable of running the phantom side of Gray's multiplex or any other plex in the business. Had he been in an electric light station he would have been an electrician. Old operators who tried to read his writing could not accomplish it, and were not sure whether it was ancient Sanscrit or modern Choctaw, and his attempts at sending were about on a par with this. Had he been able to produce passable penmanship he would have been worth about $15 per month. This style of thing is going on here constantly, but so long as shoppers are hunting bargains—so long as people expect something for nothing—so long will this sort of fraud teach by experience those whom the proverb says will learn in no other school.

A Telegraph Operator's Escapades.

Shortly after Christmas of last year Irving Pierce, a telegraph operator, secured a position to receive the night report of the Associated Press in Albany, N. Y. He also worked in daylight, being employed by C. E. Ford, a bucket shop operator on State street. On November 11 he secured a half interest in Ford's business, but still retained his position in the Associated Press. For several weeks past a Sunday morning paper of that city has been publishing telegraphic news under the head of "Special," which news it is now known was stolen from the Associated Press wire and sold by him to the paper. On Saturday night another operator called on Pierce and found him taking from the wire four manifold copies of Associated Press news, or more than was necessary. When asked why he was doing this he said he took an extra copy home for his folks to read. His superior was informed and Pierce was immediately dismissed from the Associated Press. On Monday night he disappeared with the books of the bucket shop, and margins aggregating $2,000. It is said that he bought oil on Monday and lost heavily, and that he closed out several customers and used their margins to cover his own losses. Pierce is married, and his wife, whose parents reside in Adams, N. J., is very highly respected. His present whereabouts is unknown.

Japanese by Telephone—The Mikado's Uncle at the Wire.

Ex-United States Senator McDonald and a group of other well-known Americans, who were invited Sunday to witness the interesting experiment of hearing the uncle of the Mikado, Prince Komatsu, talk Japanese over a telephone all the way from New York to Washington, were disappointed in a wholly unexpected way. The experiment was to be tried over the Turnbull inter-ocean telephone, a long distance instrument, over which Chinese dignitaries and other prominent personages had previously talked. The Prince arrived at 2.15 o'clock, preceded by his interpreter. The interpreter greatly astonished ex-Senator McDonald and all the other guests by bluntly announcing in English that the uncle of the Mikado had brought his wife, the Princess, with him, and would on no account enter the room if any of the Americans remained. The Prince kept his word, too, and did not come up stairs until the Americans left in a body. W. L. Paine, who had charge of the New York end of the experiment, who was staggered by the Prince's order, apologized to ex-Senator McDonald and the other guests, who acquitted him of all responsibility for the unpleasant incident.

When the Americans had gone down stairs, the Prince and his suite came up and shut themselves in the room with the telephone. Little Grand Chamberlain Yoshitane Sannomiya and his large wife, who looks like an English woman, and the interpreter, followed the Princess. Dr. James Green, son of Norvin Green, president of the Western Union Telegraph Company, was the only American, excepting Mr. Paine and his assistant, W. J. Cauly, that the Prince would admit to the room. Dr. Green only got in because he was consul to Japan. The telephone box was connected with wires leading into the Arlington hotel at Washington. Count Eugene Metkiewics had charge of the instrument there, and M. Kuki, the Japanese minister, was beside him to talk Japanese with the Prince When the Prince got through, the Princess talked into the receiver and seemed delighted with everything. They all talked Japanese, and Mr. Paine said the language went over the wires all right. Afterward a number of Americans, who had been entertained with stories of Japan by a handsome gentleman who had come to talk Japanese to the Prince, and got disappointed along with the others, talked American over the wires with Washington newspaper correspondents.

TELEGRAPHIC

.... At a meeting of the stockholders of the Pacific Postal Telegraph Cable Company, the following officers were elected: President, John W. Mackay; vice president, W. C. Van Horne, vice-president Canadian Pacific Railroad Company; treasurer, E. C. Platt; secretary, J. O. Stevens; directors, Sir George Stephens, president of the Canadian Pacific Railroad Company; C. R Hosmer, A. B. Chandler, H. Rosener, H. Decastro, and J. O. Stevens.

.... The floating expedition to lay the U. S. Signal Cable between Block Island and the coast was in command of Mr. F. M. Ricketts, and consisted of barge Bella and tug E. Luckenbach. Twelve nautical miles of cable, the property of E. S. Greely & Co., was on board. After laying this at Block Island, Mr. Ricketts goes to Cape Charles, where he will lay another cable from that point to Cape Henry also, for the Signal Service. The latter cable is 15 nautical miles in length, and is furnished by the Western Electric Company.

.... The work of running the wires for the new electric fire alarm in Salem will be begun this week. There will be twenty-five boxes, in addition to which each of the present police boxes will be de-ignated by a number. The central station will be at the police office, and First Assistant Engineer W. O. Arnold will be superintendent of the alarm. There will be a whistle on Zina Goodell's machine shop, and one on Tuttle's tannery, besides which there will be strikers on the bells on the Bentley Schoolhouse and the Central Baptist Church. The system will be ready for use by January 1st.

..... The city of Erie, Pa., expects to have its new fire alarm system in working order in another week. Under the new system, the city will be divided into five districts or loops each engine house or station being connected with at least one of the loops. Thus should a break occur in one of the wires it would cripple that district alone. The news of a fire, should the wire be crippled, would of course be telephoned to headquarters, and from there it could be sent out to all the stations under the new repeating system which it is proposed to introduce at headquarters.

.... The annual meeting of the stockholders of the American District Telegraph Company, Brooklyn, N. Y., resulted in the election of the following officers: H H. Wheeler, president; David Barnett, vice-president; Executive Committee, H D. Polhemus, H. W. Hunt, Chas. H Wheeler; T. J. Powell, secretary and treasurer; and Messrs. H. D. Polhemus, H. H Wheeler, T. J. Powell, Samuel Richards, E. Spicer, A. B. Thorn, W. M. Van Anden, Charles H. Wheeler, David Barnett, H. W. Hunt, J. F. Pierce, Felix Campbell and S. H. Herriman, trustees; inspectors, W. B. Davenport, Henry Beam and Joseph W. Carroll.

.... The twentieth annual meeting of the Telegraphers' Mutual Benefit Association was held in the Western Union building yesterday afternoon. The net gain in membership for the year ending October 31 was 230, the present membership being 3,102. There were 22 deaths during the year. The total income for the year from all sources was $43,008.29, and the disbursements were as follows: Death claims, $25,208.70; current expenses, medical examiner's fees, $3,169,77; invested on account of reserve fund, $6,757 50; leaving a balance of cash on hand of $7,872.32. The balance due and outstanding is $3,411 64, and the pay value of the reserve fund $48,000. The following officers were re-elected: President, A. R. Brewer; vice-president, W. H. Young; secretary, Charles P. Bruch; treasurer, E. T. Mackay. The executive and auditing committees were re-elected without change.

Rules for Handling Electric Currents.

(*Continued from fifth page.*)

RULE XI.

Conductors conveying alternating primary currents of high E.M.F. must be kept a minimum distance of 12 inches from each other, and inclosed in separate highly-insulating fireproof casings.

RULE XII.

Conductors conveying currents for incandescent lighting and having a less E.M.F. than 200 volts and run along walls or other exposed supports, should be placed at least 2½ inches apart, and a similar distance from all other wires or metallic bodies, except as provided in Rule IX.

RULE XIII.

Conductors for arc or incandescent lighting currents should be placed in grooved mouldings or casings of wood or dry plaster, or like material, preferably arranged along the cornice line, and in such case there should be a septum of the wood or material, having a thickness of three inches for arc currents and one-half of an inch for incandescent currents between the wires; wooden mouldings may be rendered fireproof by painting them with a solution of tungstate of sodium in water.

RULE XIV.

Single or twin wire insulated conductors may be carried through electroliers or gas fixtures, but especial care must be taken to insulate such conductors from the metal parts of the fixtures.

RULE XV.

The location of all concealed conductors should be plainly designated by an appropriate mark.

RULE XVI.

No metallic staples, nails, hooks or devices for attaching and supporting electrical conductors should be employed in buildings. Wooden cleats or porcelain saddles must be provided. Two conductors conveying high potential currents should never be included in the same saddle or cleat.

RULE XVII.

Twin insulated wire may be employed in branches feeding single incandescent lamps in parallel of the main circuit.

RULE XVIII.

All joints should be mechanically and electrically perfect—the ends cleaned, united by solder (acid flux employed) and wrapped with insulating tape.

RULE XIX.

Safety fuses should be provided at both points of junction of a branch circuit with a main circuit and the conductivity of such fuses should in no instance exceed 50 per cent. of the current designed to operate the devices in circuit.

RULE XX.

Where practicable, all safety fuses for each room should be placed in a conveniently located fire-proof box, so that they can be inspected or renewed without inconvenience or injury to the premises.

RULE XXI.

A cut-out switch which can be operated by the firemen or police must be placed in the circuit in a well-protected and accessible place.

RULE XXII.

Magnetic cut-outs or circuit breakers should be used in preference to fusible strips on arc or power circuits, and should be adapted to be thrown into action by any increase of current amounting to 50 per cent. or less, as specially required.

RULE XXIII.

Magnetic cut-outs for use in secondary distribution circuits should have double poles, and arranged to act at 25 per cent. above the normal current, and be placed as near the entrance of the primary conductors into the building as possible.

RULE XXIV.

Where incandescent lights are run on arc light circuits, fastening or attaching lamps to any gas or other metallic fixture which may be in electrical connection with the earth is prohibited.

RULE XXV.

Distributor boxes on arc-light circuits should be convenient of access, kept free from moisture and dust, and as far removed as possible from other electrical devices, pipes, metals, etc., or earth connections.

RULE XXVI.

Distributor boxes must not be placed in any circuit wherein the E.M.F of the current transmitted exceeds 1,000 volts.

RULE XXVII.

Distributor boxes must be arranged to automatically cut out the arc current should any defect arise or accident occur, either in box or incandescent circuit.

RULE XXVIII.

In working distributors, an ampere-meter should be included in the circuit, and connected with an audible alarm, so that warning will be immediately given should the current exceed the standard amount.

RULE XXIX.

All switches, cut-outs, safety fuses, resistance boxes, distributors, regulators and the like must always be mounted on a non-combustible insulating base.

Their contact surfaces kept bright, and movable parts examined at least once a day.

RULE XXX.

All switches must be quick in action, and arranged to simultaneously make and break at both poles. Lapping connections and rubbing contact are to be preferred.

RULE XXXI.

Arc lamps should never be employed in factories where there is fine dust, as from flour, pulverized cork, or similar substances, floating in the atmosphere.

RULE XXXII.

The frames and other exposed parts of arc lamps should be properly insulated from the circuit Each lamp must be provided with a proper hand-switch, and wherever it is possible that an excessive current may be thrown on to any one lamp, or series of lamps, automatic shunts or switches must be provided for each lamp, to prevent all possibility of the formation of a dangerous arc.

RULE XXXIII.

Arc lamps should be provided with means to prevent the carbons from falling out should the clamps fail to hold them.

RULE XXXIV.

Arc lamps should have their globes closed at the bottom; and wherever they are placed in proximity to any combustible material, like draperies, goods in show windows, flyings in fabric factories, or in wood-working establishments, they must be provided with very high globes or spark arresters, and the globes be surrounded by wire netting, to prevent the falling of a broken globe. Broken globes must be replaced at once.

RULE XXXV.

Incandescent lamps should in all cases be mounted in sockets, which effectually conceal the terminal connections. Safety plugs should not be allowed in lamp holders.

RULE XXXVI.

No dynamo or other source of dynamic electricity or motor shall be placed in any room of any cotton, woolen, flax, jute or flour mill, or similar mill of like description, excepting in the engine room thereof, and where it is necessary to locate a dynamo or other source of electrical energy or motor in a dangerous position; such generator or motor should in all cases be housed, and special permission must in all such cases first be obtained.

RULE XXXVII.

Dynamos, generators and motors in all cases should be placed on dry foundations, and preferably raised from the floor by means of insulating skids They should be kept free from accumulations of oil and dust. A main switch should be placed at or near the dynamo or motor.

RULE XXXVIII.

Dynamo electric machines should in all cases be provided with an automatic governing device, capable of controlling any change in the current

RULE XXXIX.

Storage cells should in all cases be arranged with a space of one inch between the cells, on insulating supports, and in a dry place, a metal tank, or tank lined with metal, placed under them, to catch any leakage. They should be kept free from moisture and dust, and preferably should be enclosed in a box, provided with holes for the escape of gas.

RULE XL.

Fusible safety strips should be located in the leads conveying the charging current to the storage battery, and in circuit from storage battery to translating devices. Switches should likewise be placed in both circuits. Magnetic cut-outs may be employed in place of fusible strips.

RULE XLI.

All circuits shall be tested at least twice a day, with some approved apparatus designed for that purpose, in order to discover any ground connection or escape that may exist. A record of these tests shall be entered in a book provided for this purpose, and a transcript thereof furnished to the proper authorities once a week.

RULE XLII.

Where secondary generators or transformers are employed, they should be preferably located exterior to the building, in a specially prepared fire-proof structure, which should be perfectly dry. Where necessity requires that they be within the building, they should be housed in a dry wooden room, lined with asbetos board. A cut-out should be included in the primary circuit, adapted to act at any increase of 25 per cent. above normal current. A warning or danger sign should be placed upon the door of such housing.

RULE XLIII.

When electric light or power circuits are intended to be constructed, full particulars of the proposed installations and all its details must be given in writing to the proper authorities. This must be accompanied by samples of the conductors, with a statement of the maximum current which it is designed to send through each.

Samples of the cut-outs, switches and fusible plugs should likewise be submitted, unless they have previously been approved. The signing of these rules and regulations by an electric lighting, power, or other company transmitting electric currents, shall be considered as a guarantee on their part that they will faithfully observe all the conditions and make such reports as are therein provided.

II.—RULES TO BE OBSERVED IN LOCATING AND CONSTRUCTING AERIAL AND UNDERGROUND CONDUCTORS.

RULE I.

Conductors conveying currents having an E. M. F. of over 50 volts, where carried through cities or closely settled localities, should in all cases be insulated.

RULE II.

Conducting wires over buildings must be located at least seven feet above the roofs, and also high enough to avoid the ladders of the fire department.

RULE III.

Conductors conveying currents for arc light or power, secondary distribution or the like, and when run parallel with telegraph or telephonic conductors, should in no case be nearer than ten feet where single, and six feet where double. By double is meant outgoing and return leads.

RULE IV.

Conducting wires must be secured to insulating fastenings and covered with an insulation which is water-proof on the outside and not easily worn by abrasion, and where wires are passed through wall, cornices or the like should be protected as in Rule XI.

RULE V.

Conductors carried along the exterior walls of buildings should in all cases be supported upon glass or porcelain insulators, placed at least ten inches apart, and so arranged as not to be liable to abrasion from cornices, metallic shutters and the like. Special means should be provided to prevent accumulations of ice upon such conductors.

RULE VI.

Conducting wires conveying currents such as employed in electric lighting and power, and which are in proximity to other wires, should be so secured or guarded as to prevent any possibility of contacts between the wires in case of accidents to the wires or their supports.

RULE VII.

All conductors carried underground should be encased in lead and preferably located in conduits made of a material which is non-porous to gas or water, non-inflammable and of good insulating character.

III.—RULES TO BE OBSERVED TO PREVENT ACCIDENTS TO LIFE.

RULE I.

No work of any sort, kind or description should be done upon an electric circuit whereon the E.M.F. of the current flowing exceeds 50 volts for alternating currents and 200 volts for continuous currents.

RULE II.

Where it is necessary to repair any portion of the line or fixtures, or lamps or other translating devices contained therein or thereon, and the current be flowing thereon, such portion of the line or fixture must first be cut out of circuit by means of a suitable cut-out, which should be in electrical connection with a visual or audible tell-tale device to show or make evident by sound, that no current is flowing on the line.

RULE III.

Where bare conductors are employed for the transmission of power, they should rest upon insulating supports, and be provided with an insulating covering for at least two feet each side of the insulating supports.

RULE IV.

Long lines having a number of arc lights in series should be provided with a shunt and suitable cut-out switch around every five lamps.

No More Gas Wars.

Those who have heretofore entertained any doubts regarding the ultimate success of electric lighting as a solid business industry, and the important position which its advocates have always claimed it would yet command in the commercial sense, have at last become convinced that their skepticism upon this subject has been ill-founded.

The enormous increase in the use of the arc light during the last year is exciting considerable attention in commercial circles. A somewhat significant and startling feature in the business is the fact that the more advanced and progressive gas managers are waking up to the importance of the great strides now being made in the electric arc light field, and are now generally accepting the theories which have for the last four or five years been so strenuously advocated by Mr. Edwards H. Goff, the founder of the American system of electric lighting, viz.: that the genuine interests of the gas and electric light companies were identical, that they should work together as allies, instead of opposing each other as common enemies.

One of the strong points which Mr. Goff has always made in his arguments is that increased use of the electric light would invariably cause increased consumption of gas, particularly where the electric light was used for street illumination. Mr. Goff's ideas upon this did not at first meet with any favor whatever with the gas or electric light companies, outside of his own, and were generally opposed and scouted, whenever discussed, until during the last few months. It seems that a complete revolution has taken place in the minds of the gas people, and now many of the gas companies are adopting the electric light themselves for street lighting, and nearly all of the companies are seriously considering the matter.

From a recent circular issued by the American Electric Manufacturing Company, of which Mr. Goff is president, it is discovered that two wealthy gas companies have not only adopted the American electric light to operate in connection with their gas plants, but have actually become general agents for the American Company in selling its apparatus. The companies alluded to are the St. Paul Gas Company, of St. Paul, Minn., and the Citizens' Gas Company, of Jacksonville, Fla. Mr. Goff certainly ought to feel that although his advanced ideas upon this subject did not for a long time meet with any favor, the general adoption of them now by the gas companies as sound and business-like is ample compensation for his fidelity to the subject, especially as it is altogether likely that the gas interests of the country will naturally look to the originator of this plan of business as their material and loyal ally.

Several other gas companies in different parts of the country are already adopting the American system of electric lighting. Among the more important recent contracts of this kind is that made a few days ago with the Suburban Light and Power Company, of Boston, composed of gentlemen in the management of the Brookline Gas Light Company, through the president, Dr. Robert Amory, and treasurer, Mr. Francis W. Lawrence, which has contracted with Messrs. Sowdon, Elder & Wright, of Boston, New England agents of the American Electric Manufacturing Company, for an installation of the American system of electric lighting, and for the construction of complete wire and pole lines extending through Brookline, Brighton and Allston. The contract thus awarded is a strong indorsement of the American system, inasmuch as the decision was, as we are informed, arrived at only after several months devoted to examinations and tests of the various systems of electric lighting, by a committee composed of Dr Amory and Messrs. Lawrence and Holtzer; the latter of the eminent and well-known firm of L. W. Fuller & Holtzer. This is without doubt the largest single contract for electrical apparatus and construction work ever made in New England, as the plant contemplated by the Suburban company is on a very extensive scale, the rights of way already obtained in Brighton and Allston permitting the erection of 700 poles, and the complete circuits will require some 75 miles of copper wire. This change of front on the part of the gas companies is very significant, and it certainly places the electric light in a commercial position equal to that of the gas companies.—*N. Y. Tribune, Nov.* 16.

The New Electric Light Works in Detroit.

The building of the Brush Electric Light Company, of Detroit, will be two stories high, and at the outset will accommodate 48 dynamos of 65 lamps each—a 3,000 light plant. The lower floor will be arranged to receive three large engines, one of which will be 300-horse power and the others 180 each. There will also be three other smaller engines, besides provision for 30 additional ones to be used in case of necessity. Each is calculated to run one dynamo. The electric machines will all be on the second floor.

The main engine and machine building measures 55 by 103 feet, and has an addition for large engines measuring 35 by 45 feet.

The boiler room at the outset will be 135 by 60 feet, containing a nest of ten boilers. In continuation of the boiler room is a space for another of the same size. The Michigan Central railroad runs a switch through the boiler room from end to end, so as to facilitate the handling of fuel. They will also have space for extra boiler rooms at the end of the large boiler room and at right angles thereto.

It is the purpose of the company to produce light and furnish electricity to operate motors. This branch of the business they expect to develop into one of the heaviest done by any similar concern. The motors will vary in size from three to sixty horse power. The company will go into its new quarters with a machinery plant costing $60,000, but with space to accommodate a plant worth three times that amount.

"It will be the most complete electric light plant in the world," said President Leggett. "Detroit has the largest territory covered by public electric lighting in the world, and it is necessary to have the very best appliances in existence with which to carry it on."

Electric Lighting in Boston.

When the electric light first began to be introduced in the streets, stores and offices of Boston, all the profits of the invention were absorbed by the companies controlling the patents, while the corporations engaged in the actual work of constructing and operating the electric lighting plants seemed to have entered upon a thankless and profitless enterprise, whose inevitable end was bankruptcy. But under good management these conditions are now changing, the operating companies are approaching a sound business basis, and the parent companies are forced to be content with a much smaller share of the profits.

The number of companies engaged in the business of furnishing electric lighting plants in Boston, or of maintaining or operating them, is so large at the present time that competition is putting the lights within the reach of the public at very moderate prices. The difference between the electric lighting service and the telephone service in the matter of competition is very marked. Of the various local electric lighting companies' five different corporations compete for the business of furnishing arc lights for stores and streets. About 480 electric street lights are in use in Boston, the greatest number being furnished by the Brush Electric Lighting Company, of which Mayor O'Brien is treasurer.

The city advertised for bids some time since for furnishing electric street lights, and received offers from the Brush, the New England Weston, the Citizens', the Merchants', and the Charlestown Gas Company. The Charlestown Gas Company has lately put in a small electric lighting plant, and is furnishing electric lights in the Charlestown district. Nearly all of the bids were at the same figure, 65 cents per light per night, and it was possibly for this reason that no awards were made, the lighting being done by the same companies as heretofore, without any new contracts.

The city auditor's report shows that the sum of $101,978.65 was paid by the city for electric street lighting last year. Of this amount the Merchants' Company received $5,946.38, the Citizens', $6,729.66; the New England Weston, $34,732.74, and the Brush (Mayor O'Brien's company) $54,569.87. Not more than a third of the business of the Brush Electric Lighting Company, however, consists of street lighting. It probably furnishes twice as many lights for stores as it does for the streets.—*Boston Advertiser.*

Valuable Feed-Water Heater for Electric Light Companies.

The feed-water heater illustrated on this page is in very extensive use in the United States, and for the past two or three years, as the companies became acquainted with its efficiency, has been in great demand in electric lighting circles. About 200 are in use in this business, and the extensive works of the National Pipe Bending Company, at New Haven, Conn., are crowded with orders, a large number of which are sent in by the electric light companies that are being organized in all parts of the country. This company's feed-water heater is manufactured in some seventeen sizes, ranging from 8 to 2000 horse power. We take pleasure in presenting the claims of this heater, and are confident that it merits the universal praise given it by all users. Col. S. J. Fox, president of the manufacturing company at New Haven, is a member of the National Electric Light Association, and has a host of friends among the fraternity, who feel that they have been benefited by the introduction of this heater.

—— The Freeman Print Works, North Adams, Mass., are putting in an electric plant. The apparatus will be put in the printing and finishing rooms. The plant consists of nine lights of sixty-five candle-power each. Part of these are arc and part of the new series incandescent. The machine for generating the electricity will be put in the furnace room.

— Ald. Frost, of Detroit, is authority for the statement that the gas companies will not bid for the public lighting next year. This, he thinks, will leave a clear field for the Brush Electric Light Company. He hopes to have the city charter amended so that outside companies can come in and bid for the contracts for a number of years. When the contract is let for only one year, there is no inducement for an outside company to try for it, he thinks.

Feed Water Heater of National Pipe Bending Co., New Haven, Conn.

—— A Washington, D. C., exchange says: The uncertainty which has surrounded the United States Electric Light stock has been removed, and holders who were too timid to await developments have had their stock taken off their hands by others better informed or more willing to assume the supposed risk. The company has decided to erect a substantial brick building on the property recently acquired by the company, just below the Avenue on Thirteenth-and-a-half street, and to establish there a plant sufficient to supply 1,500 additional arc lights, or its equivalent in incandescent lamps.

—— The account published on another page shows a splendid record for the Westinghouse engine for the two months from September 6 to November 6, 1886. The names of the purchasers, and the amount of power purchased are given, making a convincing and strong statement. Sixty-seven Westinghouse engines, a total of 3,155 horse-power, were sold in the two months named, making a record that should be most gratifying to the energetic controllers of this engine, Messrs. Westinghouse, Church, Kerr & Co.

—— The Louisiana Electric Light Company of New Orleans has been ordered to wire the Carrollton Railroad depot and the St. Charles and Napoleon avenue stations, for the introduction of their arc lights. The public will appreciate this improvement.

—— The Brookside mills, Knoxville, Tenn. have awarded a large contract for the electric lighting of their establishment to the Mather Electric Company. Mr. W. C. Huff, of Atlanta, Ga., is superintending the installation.

—— The Kankakee Electric Light and Power Company of Kankakee, Ill., has been incorporated with a capital stock of $20,000, by Walter W. Hotch, William Walter Cobb, J. W. Clark and Louis H. Erich.

—— The Roxbury Gas Light Company has petitioned for authority to transfer or lease its franchise, lease its works, or contract with others to carry on its works, to furnish electric light to the portion of Boston that it is now authorized to supply with gas, and to own and erect all apparatus and wires necessary for that purpose.

—— The Citizens' Gas Company, of Orange, N. J., closed a contract on Saturday last, with the American Electric Manufacturing Company, for a 50-arc light plant for the streets of Orange. Several companies have been negotiating with the gas company, and others in Orange, for six months past; but the American system has been finally adopted.

—— The Western Edison Electric Light Company will put in a plant at Aurora, Ill. The capital stock of the company is $50,000, and will provide for the running of 1,500 to 2,000 lights of sixteen-candle power each. The Thomson-Houston Company are pushing forward the work on the plant for the city, which will be completed by November 15.

—— Since the incandescent lights have been adopted by many business houses on the principal streets, they, combining their light with the rays from the large electric lights hung in the streets, illuminate the streets in which they are hung and those adjacent admirably. It is an almost every-night occurrence to hear a stranger remark about the beauty and excellence of our electric system, some going so far as to say it is superior to any in the State. If, therefore, the few lights in use here will make such a startling and decided effect on and attract the notice of visitors, how much greater will be the effect if the whole city should be equally well lighted. The meeting at the council chamber will demonstrate who are in favor of the electric light in the streets. *Leavenworth (Kan.) Times.*

— Messrs. Poole & Hunt, the widely known engineers and founders, of Baltimore, have recently issued the tenth edition of their List of Gearing. This firm, during a business experience of over thirty years, have gradually made a specialty of power transmission machinery, particularly of the heavier types and consequently their manufacturing facilities are very extensive and ample for handling the heaviest class of work. Their Leffel double turbine water wheel is justly celebrated, and is used by numerous electric lighting companies where water-power is obtainable. The new edition of Gearing is a valuable reference, and is sent, we believe, on application.

ELECTRIC LIGHT NEWS

—— The Northampton Electric Lighting Company, of Northampton, of which E. P. Copeland is president and C. H. Pierce treasurer, has been incorporated, with a capital of $40,000.

—— The Citizens' Gas Company, of Jacksonville, Florida, who have been running an American plant of arc-lights for the past year, are now adding largely to their present plant. Two new boilers are being put in, and it is probable that the electric plant will be doubled.

—— The South Side Electric Light Company, Allegheny, has its lights all over the territory it expects to light, and hopes to supply light by making use of the recently patented system of alternate electric currents which will enable the electric supply to be furnished from Pittsburgh.

—— Biddeford has decided to adopt a system of electric lighting. Several Saco and Biddeford gentlemen have voted to organize a stock company under the name of the Saco and Biddeford Electric Light Company, and to establish a capital stock of $30,000, the shares being placed at $100 each.

—— The Westinghouse Electric Company has increased the capital stock to $5,000,000, and has decided to purchase from Mr. George Westinghouse, Jr., the exclusive right to the Gaulard & Gibbs invention. Preparations are making at the works to manufacture apparatus necessary for from 2000 to 3000 lights day.

—— The Brookline Gas Company, which are now putting in a 300 American arc-light plant, expect to have the lights in operation in three or four weeks. President Amory, of the gas company, was in the city last week, in consultation with President Goff, of the American company, regarding the work.

—— The Clinton Gas Light Company has filed a petition with the Secretary of the Commonwealth, to be presented to the Legislature, asking for authority to increase its capital stock to an amount not exceeding $250,000, to furnish Clinton and Lancaster with electric light and power, and the inhabitants of Lancaster with gas.

—— The moon was behind a cloud one night in Waterbury, Conn., and as no provisions had been made for the electric light or even gas light to furnish light in such an emergency, the streets were in darkness, and a number of accidents, such as collisions of teams, unpleasant falls, etc., added to the interest of the occasion.

—— A Washington journal says that the Lighthouse Board had collected a large amount of data regarding the illumination of the Bartholdi Statue of Liberty. It finds that $900 a month will be required to illuminate the statue with the same kind of light as that used during the unveiling ceremonies. It is thought to be impossible to illuminate the whole statue so that it will be seen at night, owing to its dull, non-reflecting surface.

—— Messrs. Chas. A. Schieren & Co., of this city, have recently furnished the following "Electric" belting to electric light companies—a good showing for a first-class belt: Morristown Electric Light and Power Co., Morristown, N. J.; Thomson-Houston Electric Light Co, Philadelphia, Pa.; Excelsior Electric Co., Plymouth, Pa.; Babylon Electric Light and Power Co., Babylon, L. I.; Youngstown Rolling Mill, Youngstown, Ohio; Gautier Steel Department, Johnstown, Pa.; Thomson-Houston Electric Light Co, Seneca Falls, N. Y.; Fall River Electric Light Co., Fall River, Mass.; Natick Electric Light Co, Natick, Mass.; Narragansett Electric Light Co., Providence, R. I.; Elmira Electric Light Co., Elmira, N. Y

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING NOV. 16, 1886.

352,549 Watchman's electric signal box; William W. Le Grande and George W. Burton, Louisville, Ky., said Le Grande assignor to said Burton.
352,571 Railway signal; Charles W. Pridham, Earl's Court road, county of Middlesex, England.
352,576 Station indicator; Robt. Senftner, Brooklyn, N. Y.
352,577 Line connection for mechanical telephones; George F. Shaver, New York, N. Y.
352,590 Railroad gate; Morton Toulmin, Washington, D. C.
352,596 Hinge connection for electrical instruments; George W. Wilson, Boston, Mass., assignor to the American Bell Telephone Company, same place.
352,600 Telegraph instrument; Chancy G. Wright, Chicago, Ill.
352,621 Cut-out for incandescent lamps; Hermann Lemp and Merle J. Wightman, Hartford, Ct., assignors to the Schuyler Electric Light Company.
352,622 Thermostatic cut-out for incandescent lamps; Hermann Lemp and Merle J. Wightman, Hartford, Ct., assignors to the Schuyler Electric Light Company.
352,625 Electric lamp; Darius Lyman and Marshal Wheeler, Washington, D. C.
352,645 Rapid fire signal; Thomas F. Gaynor, Lexington, Ky.
352,647 Automatic electric liquid level indicator; John J. Ghegan, Newark, N. J.
352,691 System of electrical distribution; John W. Howell, New Brunswick, N. J.
352,700 Electric railway signal; Sidney C. Mahanay and Ben. L. Campbell, near Manchester, Mo.
352,708 Storage battery; Otto A. Moses, New York, N. Y.
352,725 Telegraphic relay; Geo. Westinghouse, Jr., Pittsburgh, Pa.
352,735 Telephone; William R. Cole, Detroit, Mich., assignor to William R. Cole, Frank G. Smith and Geo. W. Moore, trustees, same place.
352,754 Flexible joint for underground electrical conduits; Seth E. Hurlbut, Chicago, Ill.
352,771 Underground tube for electric wires; Herbert G. Morehouse, Croton Landing, N. Y.
352,796 Electric igniter for gas engines; Cyrus W. Baldwin, Yonkers, N. Y., assignor to Wm. E. Hall, Chicago, Ill.
352,806 Microphone transmitter; William R. Cole, Detroit, Mich., assignor to himself and Frank G. Smith and Geo. W. Moore, trustees, same place.
352,821 Hydrocarbon incandescent light; Alexander Heilbrun, Cincinnati, Ohio.
352,861 Burglar alarm; Charles H. Dowden; Newark, N. J.
352,865 Duplex and quadruplex telegraphy Samuel P. Freir, Roselle, N. J., assignor to the Western Union Telegraph Company, of New York.
352,874 System of temperature regulation; Warren S. Johnson, Milwaukee, Wis., assignor to the Johnson Electric Service Company, same place.
352,877 Galvanic battery; Edwin J. Leland, Worcester, Mass.

BUSINESS NOTICE.

Baker & Co., gold, silver and platinum refiners, assayers and smelters, 408, 410, 412 and 414 N. J. R.R. ave., Newark, N. J. Platinum for all purposes, any degree of hardness or size. Wholesale or retail. Native or scrap platinum, melted, refined or purchased.

Business wanted for a two-story factory, 75×35, well lighted, engine, gas, etc.; built to encourage some industry in the village of Mattapoisett, Plymouth Co., Mass. Apply to P. M.

FOR SALE CHEAP.
One 12 Light Brush Dynamo & Lamps.
One 6 Light Brush Dynamo & Lamps.
W. N. GRAY,
Carlisle Building, Cincinnati, Ohio.

NEW YORK & WASHINGTON ELECTRICAL PATENTS.
FOWLER & FOWLER.

A. C. FOWLER, C. E., Attorney at Law, EXAMINER IN U.S. PATENT OFFICE, 1880 to 1886, ELECTRICAL DIVISION. Office, Temple Court (Beekman and Nassau Streets), New York City.

CHAS. D. FOWLER, Counselor at Law. Office, Pacific Building (622-4 F Street, half block east Patent Office), Washington, D. C.

Investigations and Correspondence in FRENCH and GERMAN.

EDWARD P. THOMPSON, Solicitor of Electrical Patents, and Electrical Expert (two years Manager—successor to N. S. Keith—of the Pat. Agency of the *Electrical World* and Associate Editor), who *personally* prepared and prosecuted, while Manager, every case in caveats, patents, trade marks, etc., submitted to the Agency, has established, as sole proprietor, manager and attorney, a patent office. No risks. Deposits to be held by the Madison Square Bank, New York, till the client is satisfied with the work; otherwise refunded. From the Agency's circular, distributed just befor my departure: "We could fill pages of simi ar unsolicited compliments. We might add that since these letters were received we have done additional patent business for nearly all the above, and that to our knowledge we have never lost a client." Write for personal testimonials and instructions, to E. P. THOMPSON, Temple Court, Beekman st., N.Y.

WANTED: A 20 Arc Light Dynamo, 20 or more Amperes, SECOND HAND, IN GOOD ORDER. Address, with all particulars, and best figures, *C. B. Shedd, 85 Washington St., Chicago, Ill.*

BUSINESS NOTICE.

THIS IS TO GIVE NOTICE, that on Saturday, October 30, 1886, I addressed to "J. Burke Hendry, International Agency, 446 Strand, London, E. C., England," a notice "to complete and close" whatever contract or extension thereof he, Hendry, had or pretended to have with William Mackintosh, of this city, relating to the use of certain inventions for "underground telegraph line or lines" in the cities of Brooklyn and New York; and in default of such notice reaching Hendry abroad, this is to give him notice, and also James Boys and S. S. Ely, his attorneys, and whoever may represent him or be his assigns, "to complete and close" said contract and its extension according to the terms thereof.

William Mackintosh is under disability as *non compos mentis*, but how long that has been his condition I cannot state.

JAMES W. BLACKWOOD,
Guardian of the Person and Estate of
William Mackintosh.

Providence, R. I., Nov. 17, 1886.

UNITED ELECTRIC COMPANY,
SALT LAKE CITY, UTAH, AND CHEYENNE, WYO.,
Dealers in Electrical Apparatus and Supplies.
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BOWSHER'S TELL SPEED INDICATOR.
Especially adapted to Electric Light Machinery. Is absolutely reliable. Connects to machinery with small belt. Besides continually showing speed on dial, it alarms when speed runs "too fast" or "too slow." Dial, 12 inches diameter. Weight, 10 lbs. All orders must give the exact size and average speed of shaft to be connected with.

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Special Tools and Dies. Model and Experimental Work a specialty.

Nos. 53 and 55 North Seventh Street, Philadelphia.

Fig.259

PHOENIX GLASS COMPANY,

(Works, Water Cure, Beaver County, Penn.)

Fig.255

—MANUFACTURERS OF—

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In Opal, Flint and Art Glass Effects, in Opalescent and other Colors,

A. H. PATTERSON, Manager. **729 BROADWAY, COR. WAVERLEY PLACE, NEW YORK.**

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LECLANCHÉ DISQUE BATTERY

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GENUINE DISQUE CELL, COMPLETE. The Porous Cell also bears Label.

GENUINE DISQUE POROUS CELL.

Standard ✣ Electrical ✣ Works,

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PINS and BRACKETS, BATTERIES, &c., &c.

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OUR NEW

LECLANCHE FARADIC MEDICAL BATTERY

Our Leclanche Faradic Medical Battery is of a new and entirely original design.

It is a new departure, and avoids the use of all obnoxious acids that destroy the clothes, stain the hands and make the constant handling of such medical batteries absolutely dangerous.

It is simplicity itself, and in ordinary use will run ONE YEAR WITHOUT ANY ATTENTION, OR THE EXPENDITURE OF A SINGLE PENNY FOR SUPPLIES.

There is no zinc to raise or lower, no fluids to be renewed. It is always ready, and does not corrode when not in use. Its first cost and the subsequent expense is far less than that of the dangerous red or white acid batteries heretofore manufactured.

The LECLANCHE FARADIC has three currents, is nickel-plated and mounted in an ornamentally covered case, 8¼x6¾x 5¼ inches in size, and sold at the low price of $8.50.

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The DYNAMO of this Company is AUTOMATIC in its regulation, and will Maintain a UNIFORM LIGHT with ALL or ANY PORTION of the lights in Circuit. Our LAMP will NOT BLACKEN and will MAINTAIN its CANDLE POWER during its Guaranteed Life.

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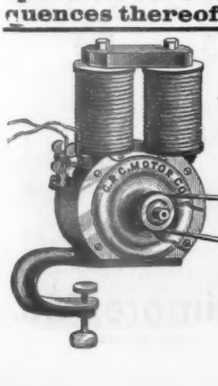
The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.



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The character and capacity of the "C & C" Electric Motor are as follows: Weight, 12 lbs.; size, 7 1-2 by 5 by 3 inches; capacity, up to 1-8 of a horse power, according to the current supplied; current capacity, 18 amperes; speed from 500 to 2,000 turns per minute, according to power required; speed required for running average sewing machine, 1,000 turns per minute; electromotive force required, from 3 to 10 volts, according to power; for average sewing machines about 5 volts; counter electromotive force generated by motor running at 1,500 turns per minute, with 18 amperes in field, 5 volts; efficiency, 60 to 75 per cent.; entire resistance of machine, the armature and field being in series, 1-7 ohm; no sparking at commutator, the armature having a continuous winding; commutator brushes are arranged so that the armature can be turned in either direction without injury of any kind; commutator does not wear out, and, together with brushes, is entirely inclosed and protected. Motors possessing these advantages are also manufactured by this company for incandescent circuits. Our two cell battery will give power for the average amount of family sewing during two or three weeks. Price of Arc Light Motor, with shunt, $22; without shunt, $17.50; Incandescent Motor, $20; Domestic Apparatus (Motor and Battery), $25. Discounts for quantities. Compound dry in cakes and cheap.

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Bechtel's Brewery, Staten Island,
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Opperman & Muller, Turtle Bay Brewery,
Equitable Building,
New York Ferry Co.,
Tribune Building,
U. S. Custom House.
Press Club,
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Hotel Brunswick,
Lotus Club,
Union Club,
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Brooklyn Bridge, and others
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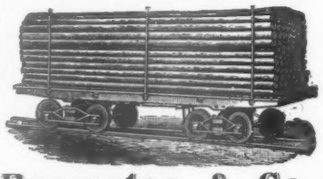

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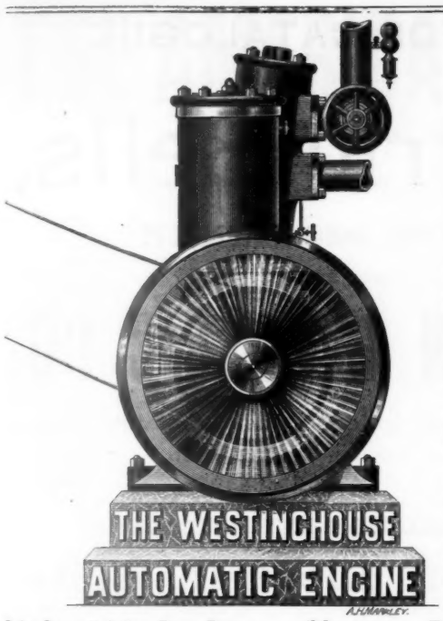

We present herewith a complete List of Orders for the Westinghouse Engine, received by us, from the **NEW ENGLAND AND MIDDLE STATES ONLY**, in the sixty days, from Sept. 6th to Nov. 6th, 1886. **FACTS ARE STUBBORN THINGS**, and it remains only for us to express our high appreciation of the confidence with which the public has honored us.

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CONTRACTING AND CONSULTING ENGINEERS,

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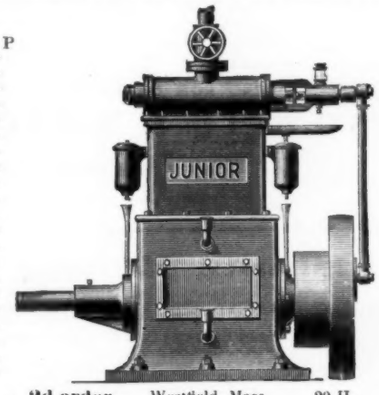
Westinghouse Electric Co.,	**2d order,**	Pittsburgh, Pa.,	200 H. P
National Dredging Co.,		New York,	200 "
Pittsburgh Electric Light Co.,		Birmingham, Pa.,	150 "
" " " "	**2d order,**	" "	150 "
Westinghouse Illuminating Co.	**3d order,**	Schenectady, N.Y.	150 "
Lynn Electric Light Co.,	**5th order,**	Lynn, Mass.,	100 "
Union Switch & Signal Co.,	**5th order,**	Pittsburgh, Pa.,	100 "
Electric Light, Heat & Power Co.,		Carbondale, Pa.,	100 "
" " "	**2d order,**	" "	75 "
Union Switch and Signal Co.,	**6th order,**	Pittsburgh, Pa..	75 "
Pennsylvania R. R.,		Altoona, Pa.,	75 "
East End Electric Light Co.,	**2d order,**	Pittsburgh, Pa.,	75 "
" " " "	**3d order,**	" "	75 "
F. A. Robbins,		Pittsfield, Mass.,	60 "
T. C. Jenkins,		Pittsburgh, Pa.,	60 "
Brush Electric Light Co.,	**17th order,**	Buffalo, N. Y.,	60 "
" "	**18th order,**	" "	60 "
Morristown Electric Light and Power Co.,		Morristown, N. J.,	60 "
Pennsylvania Steel Co.,	**6th order,**	Steelton, Pa.,	60 "
Adams Express Co.,	**2d order,**	New York,	60 "
U.S. Gov't Tender "Lucerne,"	**12th order,**	Baltimore, Md.,	50 "
J. W. Shanley, Saw Mill,		Bridgeport, Conn.,	50 "



John Leggett & Son, Paper Boxes,	**3d order,**	Troy, N. Y.,	45 H. P.	Crane Bros., Paper Mill,	**2d order,**
People's Electric Light Co.,		Greensburg, Pa.,	45 "	Howard Iron Works,	**2d order,**
" " "	**2d order,**	" "	45 "	Thos. Henshell, Silk Mill,	
Danville Nail Mfg. Co.,		Danville, Pa.,	45 "	Newton Machine Tool Works,	
Pencoyd Iron Works,		Philadelphia, Pa.,	45 "	Utica Gas Light Co.,	**2d order,**
State Insane Asylum,		Marion, Va.,	45 "	Thompson Mfg. Co.,	
" "	**2d order,**	" "	45 "	Keystone Electric Light Co.	**4th order,**
J. C. Livingston & Co., Saw Mill,		Little Falls, N. Y.,	45 "	Marton Bros.,	
Philadelphia "Ledger,"		Philadelphia, Pa.,	35 "	D. A. Hopkins,	
" "	**2d order,**	" "	35 "	Youghiogheney Coal Co.,	
" "	**3d order,**	" "	35 "	E D. Clapp Mfg. Co.,	
" "	**4th order,**	" "	35 "	Hudson River Paper Co.,	
Van Deventer & Horne, Hosiery Mill,		Plainfield, N. J.,	35 "	Philadelphia "Ledger,"	**5th order,**
Winona Paper Co.,	**3d order,**	Holyoke, Mass.,	35 "	Worcester Gas Light Co ,	**2d order,**
Nicholas Hotton,		Partville, N. Y.	35 "	S. N. Boyd & Co.,	
Ramapo Iron Works,		Hillburn, N. Y.	35 "	Worthy Paper Co.,	
Wm. Broadhead & Sons,	**6th order,**	Jamestown, Pa.,	35 "	Johnstown Gas Co.,	
" " "	**7th order,**	" "	25 "	Phœnix Insurance Co.,	
Brainerd & Shepard,		Albany, N. Y.,	25 "	C. Fred. Ruhlman,	
Rumford Chemical Works,		Providence, R. I.,	25 "	W. A. Andrews,	
American Press Association,		New York,	25 "	J. Forward,	
C F. Davis, Paper Mill,		Valatie, N. Y.,	25 "		
Electrical Accumulator Co.,		New York,	25 "		
E. L. Tunis & Co.,		Baltimore, Md.,	25 "		

Westfield, Mass.,	20 H.		
Buffalo, N. Y.,	20 "	P.	
Paterson, N. J.,	15 "		
Philadelphia, Pa.,	15 "		
Utica, N. Y.,	15 "		
Lancaster, N H.,	15 "		
Philadelphia, Pa.	15 "		
Taunton, Mass.	15 "		
Jersey City,	15 "		
Pittsburgh, Pa.,	15 "		
Auburn, N. Y.,	15 "		
Mechanicville, N. Y.,	15 "		
Philadelphia, Pa.,	10 "		
Worcester, Mass.,	10 "		
Richmond, Va.,	10 "		
Springfield, Mass.,	10 "		
Johnstown, Pa.,	10 "		
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New York,	5 "		
Shippensburg, Pa.,	5 "		

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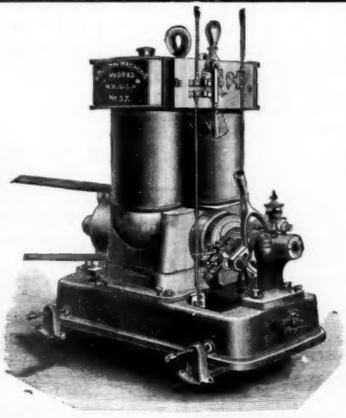

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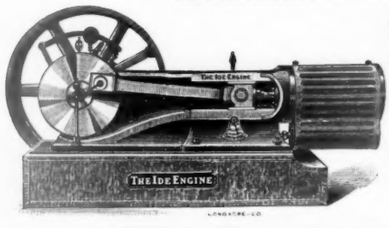

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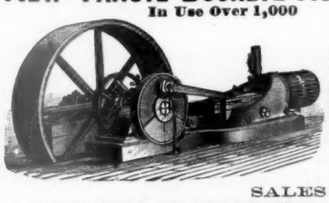

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	Number of Lights Sold.
Carew Manufacturing Co., South Hadley Falls, Mass	10
Merchants Electric Light & Power Co., Boston, Mass	50
Ware, Pratt & Co , Worcester, Mass	15
Arlington Mill, Lawrence, Mass	300
Washington Mills Co., Lawrence, Mass	450
Citizens Electric Light Co., East Boston, Mass	75
American Illuminating Co., Old Orchard Beach, Me	35
American Illuminating Co , Hornellsville, N Y	125
Saratoga Electric Light Co , Saratoga, N. Y	125
Poughkeepsie Electric Light Co., Poughkeepsie, N. Y	50
Jacksonville Gas Co., Jacksonville, Fla	50
St. Paul Gas Co , St. Paul, Minn	25
Badger Illuminating Co., Milwaukee, Wis	200
Badger Illuminating Co., Chicago, Ill	100
American Illuminating Co., Augusta, Ga	85
George A. Mayo, Friendship, N. Y	10
Electrical Development and Manufacturing Co., Boston, Mass	15
W. F. Hall, Kennebunk Beach, Me	10
Asbury Park Electric Light Co., Asbury Park, N. J	35
Bamford Bros., Paterson, N. J	35
Nov. 15, 1886.	
Fort William Henry Hotel, Lake George, N. Y	6
Tudor Iron Works, St. Louis, Mo	25
Lord & Taylor, Grand Street, New York City	60
Manchester Locomotive Works, Manchester, N. H	80
Le Roy Salt Co., Le Roy, N. Y	35
American Illuminating Co., Oneida, N. Y	50
Dr. T. V. Roe and associates, Tarrytown, N. Y	35
Consolidated Electric Light Co., Portland, Me	25
P. T. Hallahan, Philadelphia, Pa	15
Brush Electric Light and Power Co., Nashville, Tenn	50
H. M. the King of Corea	4
Brookline Gas Co., Brookline, Mass	300
Bridgeport Malleable Iron Co., Bridgeport, Conn	25
American Illuminating Co., Saco and Biddeford, Me	100
Edison Illuminating Co , York, Pa	25
Edison Illuminating Co , Lawrence, Mass	6
Seth W. Fuller & Holtzer, Boston, Mass	10
	2,646

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St. Paul Gas Co., St. Paul, Minn.—State of Minnesota.
Citizens Gas Light Co., Jacksonville, Fla.—State of Florida.
Sowdon, Elder & Wright, 131 Devonshire St., Boston.—New England States (except Connecticut.)
Pittsburgh Electric Company, Eugene Ingold, General Manager, 213 Wood St., Pittsburgh, Pa.—Western Pennsylvania, Ohio, Kentucky and West Virginia.
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Markle Engineering Company, Detroit, Mich.—State of Michigan.

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The Edison Electric Light Company having instituted suits on its patents, must decline to substitute the advertising columns of the press for the courts for the purpose of their legal interpretation. Mr. Edison's Carbon filament patent of 1879 covers broadly the modern incandescent lamp. The claim that this patent has ever been in litigation in the United States Patent Office is absolutely false. In Germany and England this fundamental patent has finally prevailed against all infringers, thus establishing the fact that Mr. Edison's great invention has been nowhere anticipated. Ergo, a like result must follow in the United States. The straining and distorting of these facts, together with the violent effort to interweave with them certain minor and IRRELEVANT CASES for the purpose of fraudulently posing before the public as joint heirs with Mr. Edison in the fruits of these patent decisions, only indicate the DIRE EXTREMITY of those who are thus gradually becoming ENVIRONED by due process of law.

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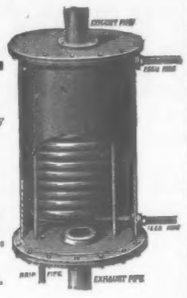

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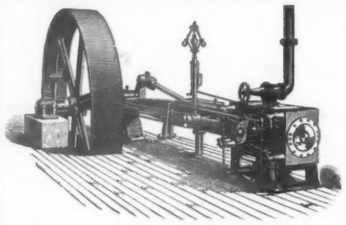

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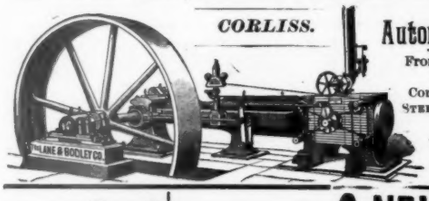

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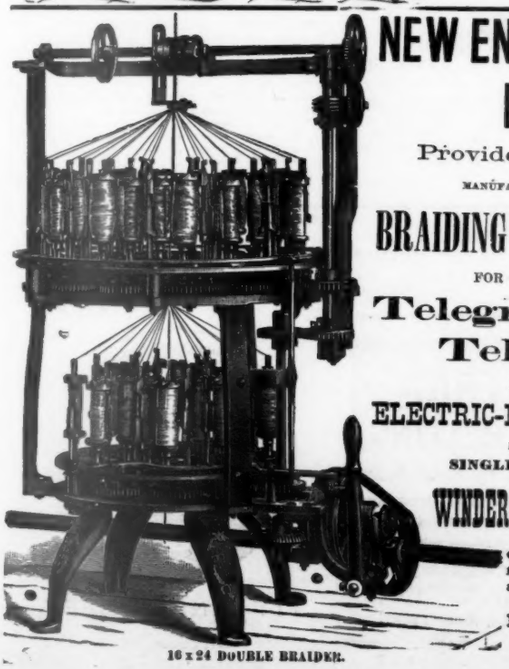

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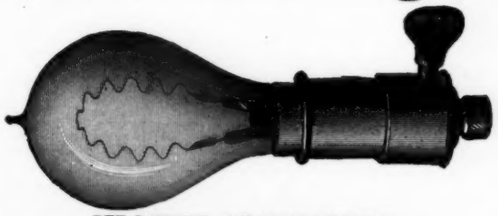

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